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The Mysore Economic Journal

A Monthly Periodical devoted to the Discussion
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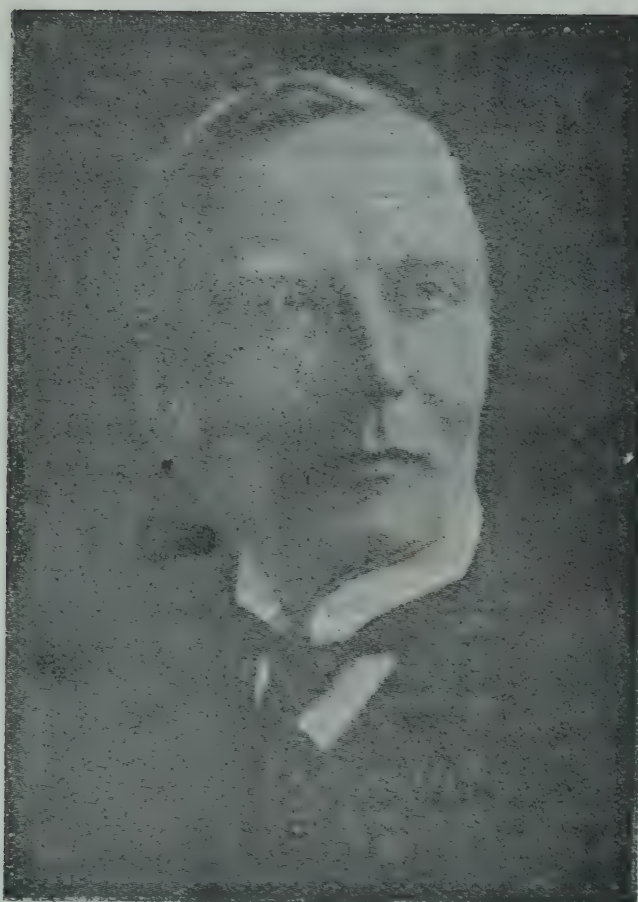
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VOL. IV

JANUARY 1918

No. 1

HUMAN WASTAGE FOR LACK OF TRAINING.

BY SIR SWIRE SMITH, KT., LL.D., M.P.

LONG years ago at the beginning of the Rifle Volunteer movement there appeared a picture in *Punch* representing a regiment of volunteers marching along a street, and a foreigner, surprised by the sight, remarks to John Bull, "I have always thought you vass great shopkeeper!" "So I am," was the reply, "and these are some of the boys who mind the shop." Britain was never more a great shopkeeper than now, and never more than at the present time had she to depend for her prosperity upon the physical strength, skill and character of the men who mind the shop. These little islands forming the United Kingdom cannot be increased in size, and yet with each decade the population increases, crowding some 45,000,000 into a smaller area per square mile than can be found in any other important country in the globe. The agricultural land, even if it were all cultivated is incapable of sustaining the population or of supplying it with the raw materials which it works up for its livelihood. The one precious commodity which constitutes the basis of its mineral wealth is an ample supply of coal, at least for its present wants. Of the food consumed by the nation, not more than three months supply—out of the twelve—is produced at home.

The whole world ministers to the wants and pays tribute to these islands, for wherever the sun shines, and the rain falls, there are people cultivating the soil and sending their produce to Britain. The vast stores of cotton that give employment to the millions in Lancashire, and some other countries; all the silk, flax, and four-fifths of the wool; together with enormous quantities of iron ore, copper, tin, the precious metals, lumber, rubber, and other raw materials, are imported from all parts of the world. And how do we pay for these vast imports? By working up the raw materials into manufactures and sending them everywhere to our customers in exchange for the goods they supply to us. Think of the magnitude of this business. We imported in 1911, food, raw materials and manufactures for domestic use and consumption, of the value of £577 millions; and exported products, mainly manufactures, of the value of £454 millions, representing a total of £1,031,000,000 of ocean trade, nearly the whole of which was carried in British ships. This stupendous foreign commerce, greater per head than that of our two most formidable foreign competitors combined, owes its success to the combination of the three great forces of our country, capital, labour, and ability—in a word, to the general efficiency of our people. Now the sheet anchor of all this efficiency is to be found in the training of our people for their work and for their duties as citizens. It is not education but ignorance and wastage that are so costly in

the utilisation and development of our national resources.

There is an endless variety in our industries, offering scope for the highest skill,—and demanding it—in science, technology, artistic designing, and craftsmanship, covering all the field of skilled and unskilled labour in manufacturing enterprises and in agriculture. In addition to the production of things, there are the great agencies for their distribution. In these varied occupations there is work for all who will qualify for it, and yet our so-called national system of education, with some commendable exceptions, takes no heed of these definite requirements. The school training of the nation's children with its bookishness gives an elementary preparation for clerks, and ignores the training of the hands and the study of "things." In the needs of industry, for every clerk required, there is a demand for a hundred craftsmen, and yet under our educational system we reverse the order of things, and give preparatory training to the hundred clerks that are not wanted, and leave the training of the craftsman severely alone. The same lack of appropriate training applies to the girls, whose only domestic teaching, in most instances, is confined to a little plain sewing. In our secondary schools there is still need for the enforcement of the recommendation of Mr. Ruskin fifty years ago, that "all youths of whatever rank ought to learn some manual trade thoroughly; for," said he, "it is quite wonderful how much a man's views of life are cleared by the attainment of the capacity of doing any one thing well with his hands and arms. At this day the most useful things that boys learn at public schools, are, I believe, riding, rowing, and cricketing. But it would be far better that members of Parliament should be able to plough straight and make a horse shoe than even to feather their oars neatly or point their toes prettily in stirrups."

I have seen many instances of boys who have passed through public schools—with

their own way to make in life—without the slightest idea of any calling or preparation for earning a living. While the German boys of the same ages are equipped with modern languages, and with a knowledge of science and some craftsmanship, the English public schoolboy with his little Latin and less Greek can lay claim to no qualification for such business as offers. And so in the language of Locksley Hall, he bewails the hard fate that throws him thus upon an unsympathetic world.

"What is that which I should turn to lighting upon days like these?

Every door is barr'd with gold, and opens but to golden keys.

Every gate is throng'd with suitors, all the markets overflow.

I have but an angry fancy: what is that which I should do!"

In any competition, the situation he seeks goes to the German boy, because he has qualified for it, and the English boy of unquestionable physique and character is passed over, and precious years are often wasted before he finds a settled occupation and has acquired the competence to discharge its duties. The age for leaving school is lower in Britain than in any of the advanced countries in Europe or America, and less regard is paid to the attendance at evening continuation and technical schools, in this than in Germany and some other countries. At from thirteen to fourteen in this country, from 500,000 to 600,000 boys and girls leave school having "finished" their education, and it is calculated that 75 per cent of them never show their faces in a school again. The apprenticeship system finds less and less favour, and it is recorded that in London the largest employment centre, it is "rapidly becoming obsolete." Vast numbers of boys get into "blind alleys," as telegraph boys, errand boys, minders of automatic machines, etc., all occupations leading them to unemployment at the very time when they should be efficient and independent workmen. And

when unemployment comes these unskilled nondescripts rapidly drift into the unemployables, and many of them approach the responsibilities of manhood as defiant and dangerous loafers with little resolution left for resisting temptation to crime. Such a wastage of human power at its best is a public calamity; unless it is checked it will become a public danger.

It is said of Charlotte Bronte and her sisters, when they were sent off to school from the lonely parsonage at Haworth, that they held aloof from the other children in their games. When invited to join they pleaded that "they had never learned to play." And when I have seen a procession of the unemployed with the usual banner, "We claim the right to work," I have a strong desire to alter the inscription to "We claim the right to *learn* to work;" for I have found on investigation that the overwhelming proportion of the unemployed have never learned a trade.

Even in the organized industries, such as engineering, machine making, wood working, etc., the system of division of labour has been carried to such a fine pitch of effectiveness, that a boy is at once put to a special machine or operation and sticks to it, often through his whole career. He is as a rule considered to be well paid, and as he passes into manhood the world assumes that he has become a skilled workman, while in reality he has no all round skill at all, and is only master of one job. It is due to this wonderful sub-division and specialisation, and British machinery made under these conditions is the most perfect in the world, but the system has in many instances not only narrowed the practical skill of the mechanic, but dwarfed his intellectual powers, leaving him practically helpless when away from the particular occupation which he has mastered. In an eloquent passage Mr. Ruskin denounces the deteriorating influence of this system. He says, "It is not truly speaking the labour that is divided but the men—

divided into mere segments of men—broken into small fragments and crumbs of life; so that all the little intelligence that is left in a man is not enough to make a pin or a nail, but exhausts itself in making the point of a pin or the head of a nail. And the great cry that rises from all our manufacturing cities, louder than their furnace blast, is all in very deed for this—that we manufacture everything there except men; we blanch cotton and strengthen steel, and refine sugar, and shape pottery; but to brighten, to strengthen, to refine, or to form a single living spirit never enters into our estimate of advantages."

The criticism is scathing, and we are grateful to Mr. Ruskin for keeping before us these lofty ideals, but we must admit that the system complained of is the outcome of the progress towards perfection in mechanical inventions and appliances, and also in the lightening of human toil; and therefore it is not likely to be abolished. But in these days of shorter hours of labour and ampler leisure, by a better foundation at school, and a supplementary training during apprenticeship in evening technical schools the outlook of the individual may be considerably widened, and much variety may be given to his manual and intellectual development. Our expenditure on education forms the most direct equipment for national service of every man, woman and child. It is calculated that a boy who begins school at three and attends till he is fourteen has had spent on him a sum of money which if invested and left to accumulate would amount to nearly £100 at the time of his leaving school. The State has surely a right to demand that this capital sum invested in the boy shall not be squandered and wasted. Just as it is the boy's first necessity to live, and his first duty to work, so it is the object of education to fit him for his work. The reasonable thing is that he must learn something of practical work while at school, and that his theoretical training must continue during some period of his active work afterwards. In the experience

of every thoughtful person education only ceases when life ceases.

The stoppage of this alarming wastage is beyond the power of philanthropic agencies, and calls for the organization and enforcement of the State.

A national system of industrial education has become a necessity. In every elementary school all boys should pass through a prescribed course of manual instruction and elementary science; and all girls through a prescribed course of domestic economy. Elementary schools should be co-ordinated with secondary schools, in which manual and technical instruction should be continued. The secondary schools should prepare students of both sexes for the universities and higher colleges, and for special technical and art schools. Facilities should be afforded for passing talented boys and girls from the elementary schools to the Universities and Technical Colleges. In every town or group of villages there should be a technical school suitable for the industrial needs and for commercial training.

In order that the practical instruction should be kept in touch with local wants the educational authority in every school area should invite the co-operation of the Labour Exchange, the Chamber of Commerce, and local employers, who should take note of all boys and girls leaving the day schools, and draft them into evening continuation or technical schools according to their proficiency or intended career. Employers should aid and encourage their apprentices and junior workmen in their attendance at technical schools, preferably in the day time during certain hours per week. In the technical schools facilities should be offered for the training of students in the various branches of workshop practice required for the all round training of a mechanic and in the applications of applied art and science for those who would be benefited by such instruction. It is wise economy to develop local industries, but still wiser to develop local talent for the benefit of the nation.

In many parts of the country enough is being done to demonstrate the supreme importance of the above recommendations, the full adoption of which would be the greatest contribution yet made to the relief of the human wastage which I believe is the greatest cause of chronic unemployment in our land.

THE PRODUCTION OF SUGAR IN INDIA—HER DUTY TOWARDS HERSELF & THE BRITISH EMPIRE.

BY MR. HAROLD HAMEL SMITH,
Editor of "Tropical Life", London.

"The Wealth of a Country depends less on its natural resources than on the vigour, the energy and the training of its people." (The Tropics) "produce the food of the world, the raw material of the world. Not, merely tea, coffee, cocoa, tobacco but grain, cotton, wool, hides, oil, minerals, &c."

The Prime Minister at the Royal Albert Hall, London, on October 22nd 1917.

"The Maxim that every one should follow is:—

"Produce all you can, consume as little as possible, waste nothing and work hard. This is what the Germans will do after the war and if we do not do likewise we shall go under."

Lord Sumner, at the Æolian Hall.

Sunday, 16th November, 1917

THE many proposals for developing the latent resources of the British Empire including India that have recently been brought before the notice of the public and been criticised, blamed and praised, all have one thought-compelling point in common no matter how diverse the policies of, and how wide apart the object striven for by, those who made the proposals may be; all have agreed unanimously that such development is necessary and that too without delay. The sooner a start is made, the better for the Empire, and people within it. However much men may differ as to how the work can best be carried out, and whatever hopes and fears each has for his own and for his opponent's scheme, all vote solid that the work must be begun and begun at once.

Probably many of us will add that the amazing part of the whole business is that we have allowed these riches of ours to remain undisturbed for so long, or if they

have been made use of at all the research work has too often been carried out by our chief enemy and the wealth extracted has gone to benefit those against whom we are now fighting and not to help our Empire, and especially our Overseas Colonies and Dominions, to prosper.

It is by no means India and our Colonies only that need tuning-up to the required concert pitch of modern efficiency to the tuning-fork of machine-believing America and highly trained and organized Germany, although in those centres the sugar industry needs attention. Here at home, our output of manufactured goods per man or woman must be increased, whilst in India and the tropical colonies, better cultivation and more intensive methods need to be introduced and adopted on the sugar estates whilst, generally speaking, agricultural co-operative banks, co-operative factories and even export centres could be brought into existence to the benefit of every one concerned,—Government exchequer, capitalist, cane farmer and estate labourer, to say nothing of the world at large that needs the sugar, or of those who sell the machinery, cultivation implements and manures, etc., without which no sugar estate can prosper.

Then again there is at least one other splendid and most interesting industry that could quite well be carried on in England where the raw material for the work is produced, whilst the industry itself has been allowed to go to the United States and largely to the German element out there, who have all along made huge profits, but doubly and trebly so since the war has been on, and this is all the more to be regretted as I believe that the brain and guiding hand of the industry is established at Jena in Germany.

I am, of course, referring to the optical industry, the glass for which comes from a well known firm in Birmingham, who export it to America (taking up valuable tonnage room to do so), where it is cut up, ground

and polished principally by a firm with German names, I understand, and connected with Leitz of Jena. Every penny, therefore, that goes to America for optical goods must have benefited Germany more or less, up to the date when America entered the war, and probably still does in spite of everything being done to prevent such things. This being so, now that this country alone, needs "tons" of these lenses, the bulk of which comes from America, we either have to make further inroads into our tonnage which we need so badly to bring us foodstuffs and munitions, for it will be remembered that the raw material, *i.e.*, glass from Birmingham, for the lenses has already had to be shipped from here, and now comes the manufactured goods back again) or else, as is beginning to happen, we are having to go without. What will become of the eyesight of those at the front, in the munitions factory or research laboratories, if we run short of lenses; better almost run short of food if we are to win the war in the near future.

And yet I would claim that, as with the production of sugar within the Empire, every lense we use could be cut and ground either in England where appliances and machinery, and even labour in the shape of disabled soldiers and ex-women war-workers will be available in any quantity or else in India, where, I should imagine, a large number of the people would take kindly to the industry, especially in centres where it is considered that an undesirably large proportion of the total population is dependent on agriculture and the raising of crops, which, of course, fail at awkward times and spread famine and want around. Owing to these facts surely the optical industry could well be established to the advantage of every one, and between these two centres we ought to be able, successfully to compete against the German output both in Europe and America.

And as it could be and should be with the manufacture of lenses, so it could be and (not should but) *must* be with the production

of sugar. Not only can this Empire of ours produce all the sugar we need but it could, if schemes of irrigation, cultivation, manuring, drainage, etc., similar to those in force outside the Empire were adopted, supply our own wants and leave enough to sell against the Austro-German beet-sugar growers and so gain an economic victory over them, as we are slowly but surely gaining a military one, in spite of all the obstacles in the way to a speedy victory. Those who doubt this should study not only what I say in the *High Price of Sugar*¹ but also the reviews by the leading journals in the sugar world on the book. Among these is the one written by Mr. Daniel Logan, editor of the *Hawaiian Forester and Agriculturist*, in which we are told that the chief motive of the book "is obviously to promote higher standards based on Hawaiian methods, in the cultivation and manufacture of sugar within the British Empire including India, with the view of supplying not only the great local needs of the British sugar-producing centres themselves, but also of creating a surplus that would go far towards meeting the huge demand of the United Kingdom—a demand that is one of the most important factors in the world problem of cheaper sugar.....Taking what he calls a modest estimate of two tons to the acre, the author calculates (that the Empire should produce) 6,000,000 tons from elsewhere than India, to an hypothetical 5,000,000 tons of sugar from India herself. With this he bids his readers think what an immense augmentation would be secured to the Empire's wealth on the one hand and, on the other, how we could dominate the sugar market of the world with such an increased output at our disposal to handle."

Following the above I then (in the book itself) go on to quote a writer in the *Louisiana Planter* of America, on the future

prospects of India as a producer of sugar, in which the following paragraph occurs.—

"In Southern India the sugar-cane grows to splendid proportions, showing as it does the adaptation of the cane crops to the lands, the fertility of the soil, and the excellence of the climate for sugar-cane production. On the other hand the more northerly provinces in India are said to produce far more sugar as a total production than is done in Southern India. This leads us to believe that, not many years hence, there will be a speedy interest excited in the production of cane sugar in India. As it stands even now, with a production of some 2,500,000 tons of common open train sugar, India imports from other countries various kinds of sugar aggregating some 800,000 tons.¹ With a teeming population, with labourers with which England has been willing in the past to supply the British West Indies to whatever extent the sugar planters there thought necessary, India is apparently without any thoroughly good organization, any carefully laid plans, looking not only to the securing of an adequate sugar supply for the home consumption throughout British India, but to enable India to become the source of supply and the main sugar dependence of the British nation."

Thus it will be seen that in the same way as India could do valuable work in the cutting, grinding and polishing of optical goods, she could and should do equally useful work in regard to the output of sugar. To do this, however, she must lay out her cane-fields, large or small, on right lines. Those in charge of the local agricultural departments must and, I am sure, will show the *ryots* the best varieties to try, the best way to plant, etc., whilst the native himself, once the incentive is there, has an amazing amount

¹ Which the Empire itself cannot pretend to supply, unfortunately, since statistics show that the present sugar crop within the Empire (exclusive of India), available for export, only amounts to 880,000 tons.—H. H. S.

¹ Published by Bale, Sons, and Danielsson Ltd., 31 Gt. Titchfield Street, W., London.

of useful knowledge and wrinkles of his own that (it can almost be said) are so useful that he seems afraid to use them lest his neighbour should see what he is doing, and not only do likewise but go one better. Jealousy was ever a nuisance, but never more so than between small agriculturists of all countries. What if your neighbour does steal a march on you, it is all for the public and your own good, and it only remains for you to carry on the game, and again secure the lead yourself. In this way and this way only, can progress be secured, and the cane-planters prosper. Let them take a warning from others not only what to do, but also what to avoid, such as slovenly ways, badly planted lands, negligent care of the crops, etc. This can be learnt from all sides and from all industries. Here, for instance, is an excellent lesson to be learnt from the cacao-planting industry in British West Africa.

The other day, His Excellency Sir Hugh Clifford, the Governor of our Gold Coast Colony, told the natives, through his speech to the members of the Legislative Council, that the Gold Coast had advantages over other centres in connection with the production of cacao that the native producers, (the whole industry is in the hands of the natives) would be wise to note and make use of, and so learn not to spoil and do away with their estates through neglecting them. So strong is the position of the native cacao planters in this Colony (but surely the position of cane farmers in India can be made equally impregnable to outside competition) that Sir Hugh Clifford, with perfect truth, went on to say, "If the price of cacao ever fell to an unreasonable level, the Gold Coast is almost certain to be still able to go on selling at a profit, whilst other centres have already well exceeded the border line of cost price"² for cacao is capable of being produced on the Gold Coast at a phenomenally cheap price, and were a slump in the market to occur, the farmers in this Colony and in

Ashanti could still sell their produce at a profit long after the rates have fallen so low that practically every other cacao-growing country had been reduced to disposing of its crop at a loss."

"On the other hand," His Excellency went on to say, and from India's point of view this is the most important portion of this little diversion, "there is no blinking the fact that the cacao gardens of this Colony are cultivated in a more slovenly and perfunctory manner than any areas of approximately similar values in the West Indies or in the Eastern Crown Colonies.....in the opinion of my technical advisers, it is all too probable that the farmers of the Gold Coast and Ashanti will, sooner or later, have to buy their experience at a heavy price through the failure of their crops, brought about by the persistent neglect of elementary, agricultural principles."

Here, therefore, is an excellent example of what *not* to do when setting out to establish a vast agricultural industry, especially when built up of thousands of small producers, as I hope to see in India when that happy time comes, let us hope that the cane-farmers will not neglect their lands, until like the cacao-planters on the Gold Coast, they are faced with the prospect of having "to buy their experience at a heavy price." Fore-warned should result in being fore-armed and I trust India's many sugar-producers will be fore-armed as to the dangers of indulging in slovenly cultivation and of neglecting their estates and crops.

Even as it is at present both India and the Gold Coast must modernise their methods and organize their industries. Until they do so, they cannot expect to gain and to enjoy the good-will and confidence of others, and to be allowed to continue in possession of lands when they are not only not making good use of them, but are probably encouraging pests and diseases to multiply and carry trouble and loss to their more painstaking neighbours.

² See *Tropical Life*, for December 1916, page 198.

The Empire to-day, as I told my readers in the December issue of *Tropical Life*, cannot afford to have millstones hung round its neck, when marching along the road of progress, in the shape of large masses of inefficient and, consequently, of half-fed people who cannot modernise their ways, and are unable or unwilling to raise the level of their own comfort or to help to increase the national wealth. Such people, must always, on the contrary, take away from the wealth of their country; they can never increase it. This being so, the time has come when it is necessary for the Empire as a whole to see that every acre of land and each unit of the population on that land, contributes, year by year, a sufficiency of money, food, raw materials, etc., to justify their existence for the public good; and the land and the individuals that fail to attain that standard will have to receive attention and be levelled up to the average of those around. All ranks, colours and creeds within the Empire must be treated along the same lines. English nobleman, Indian prince or raja, or African chief owning wide stretches of land must, in common with peasant proprietors, be called upon to justify their existence and ownership if they wish to control their properties. In the same way each workman or woman in this country, the *ryots* in India, or the natives in Africa, the West Indies and the South Seas must, each and all, if they wish to continue to enjoy their independence and to manage and control their own affairs, do so in an efficient manner, as otherwise the nation as a whole will go back and not forward. To go back would mean that, sooner or later, we or our descendants would find ourselves under the relentless iron heel of a nation, which shall be nameless, that knows not shirkers nor inefficients, and who finds a task for all, and men for each task, no matter how arduous and killing the work may be. Under *that* nation which has carried efficiency to the border land of frenzy, even if the native

dies at the job, it has to be done. This Empire, therefore, must considerably raise its standard of efficiency and through that its output of crops, etc., or else it cannot expect to stand up against a nation that does, and disaster will follow. Far better meet trouble half way, than to allow it to fall on you with a bludgeon when you are unprepared.

Going back to the future of the sugar industry of India as an example, it must be agreed that the output should be twice its present proportions, if not more, since so low a grade of sugar is produced as a rule. In future, therefore, it should be agreed that if certain districts or individuals fail to put out the agreed crop per acre planted with canes or per labourer working the land, then a locally elected committee or council of control, will have to take over the backward area or areas, and if the population, or individuals thereon, cannot or will not, even when instructed what to do, increase their outputs, others must step in temporarily and take their place, until a more capable heir or heirs, comes along to whom the property can be handed over. Such a system would go a long way to improve local methods, as no man likes to appear ridiculous or incompetent before his fellows or to lose control of his property and see it pass to another member of his family more energetic and enterprising, or at least, and more probably, less stubborn than himself. Herein lies no idea of confiscation; the family does not lose the property, but only an individual who, on account of his unsatisfactory behaviour, must, the same as a ruling head of the State, be deposed and another put in his place.

Throughout the Empire generally, half-timers, slackers and won't works generally, as well as the hopelessly inefficient must not be allowed to stand in the way of progress. Germany does not tolerate such people, and on this point we shall be wise to follow her example; for, unless we do so, we cannot expect to maintain our supremacy either in the world of politics or commerce. Those

who agree with this, must also agree that one of the first industries that needs attention is the production and output of sugar within the Empire, and especially in India, where the possibilities of an immediate increase are more promising than elsewhere.

As I state on page 37 of the *High Price of Sugar*, it is not too much to ask India, if she stops or restricts the migration of her surplus population from India to other sugar-producing centres within the British Empire, to rouse herself and produce far more sugar in future in order to make up any deficiency elsewhere that the absence of her labourers may bring about. Even India, in spite of her (so-called) surplus millions which are or which, rather, would be no surplus at all, if her economic resources were, even fairly fully developed, must go in for a more intensive system of cultivation, in order to cheapen costs and to increase her output (of all crops) per man and per acre. In transport costs alone, the more intensive the cultivation the greater the saving, as even Cuba, the home of extensively cultivated cane fields, is fast realising. She is finding, or rather, the American capitalists who are financing the huge central factories to manufacture her output of sugar are finding, that if the mills are to be kept going regularly at fuller speed and top pressure, and the factory cannot pay if this is not the case, then the canes must be produced closer to the *Central*¹ as otherwise the lengthy distances discourage if they do not actually prevent regular deliveries. This means that active steps are being taken, (as is fully discussed in the *High Price of Sugar*, page 31 *et seq*) to remedy by removal, the generalized Cuban policy of cheap, extensive, low-yield plantings and to substitute intensive cultivation with its heavier yields, although the cane per ton landed at the factory costs rather more. It is being found, however, that such yields are cheaper in the end than huge collections

of low yields of cane lying rotting *in situ* through lack of ability to transport the cane to the mills before it is too late to do so.

As with Cuba so it is with India. Not only would intensive cultivation reduce the cost of transport, and keep the mills (yet to be established) always running at full pressure, but it is always cheaper to grow cane under such a system for, as the greenest novice can realize, less men are needed to produce twenty tons from ten acres than from twenty. Thus, if we wish to see India wealthier, happier and healthier by increasing and cheapening her output of sugar to start with, efforts must be made (as I understand is being done and with some measure of success) to induce her cultivators to adopt more up-to-date methods of cultivation and to use increased quantities and more suitable mixtures of scientifically prepared manures. If the cultivators, especially to the poorest and most backward *ryots*, cannot afford to adopt such improvements, then the local council or committee, or the agricultural authorities must see that such men are financed at a fair rate of interest and, when the crop is raised and sold, that they receive their net proceeds promptly and with as small an amount of charges deducted as possible.

Such a scheme is, I know, no easy task, but there neither is the one now being worked out in Europe to win the war and so if India is asked to put her sugar (and every other) industry in order to help pay for the war when it is won, no more and even far less is being expected of her than of her sons, and the sons of the British, the French and other Allied nations, who have already died and are still being killed and wounded to keep India happy and prosperous. At first much persuasion and perhaps even considerable pressure or even, as already suggested, actual forfeiture in respect to the present owner, will be necessary before a good start is made and sufficient progress and profit made sufficiently clear to induce

¹*Central* is the Cuba name for a large central factory.

the general run of cultivators to adopt the new methods, because they can see that it will pay them to do so. Once, however, that idea is realised, and the bulk of the people see a few receiving larger returns, promptly paid, possibly obtained also by less strenuous and back-aching labours, the wish to do likewise will become infectious and spread round with pleasurable rapidity.

No one can sit up, especially in these times, and say which is the best policy, agricultural or financial, to pursue in any particular area over such wide-spreading a country as India. One can only broadly outline a scheme and then leave it to local experts to fill in and work out the details. If no local expert or experts exist they must be found, or men trained and placed where needed, otherwise nothing can be done. With so many agricultural schools and training colleges as India (unlike Ceylon, Malaya or the West Indies) is fortunate enough to possess, such men should easily be forthcoming, especially if steps be taken at once to start the ball rolling.

I believe I am right in saying that the sugar world generally has always been ready to give India full credit for what she has done, and what she could do in the way of sugar-production. This is clearly shown by what the *Louisiana Planter*, to take but one case, had to tell its readers on the matter, and since this is so, our Eastern Empire cannot pretend that she has not the eye of the world fixed on her, or that the glances are either jealous or envious, but rather with an expression of good-will and anxiety to see her go ahead and prosper. It will be all the more shame to her, therefore, if she cannot rise to the occasion and find a way out of her present morass of difficulties and, giving herself a good shaking, wake up and start putting her sugar and other industries in order.

A thorough re-organization based on carefully thought-out plans, must be evolved, and those working out the scheme must ever

keep their eyes on the best producing centres, not only in India itself but on others beyond her shores and copy their plans, make trial growths of their most successful varieties of canes, and above all, adopt their systems of draining, cultivating, irrigating and manuring the planted areas. When this is done, the areas so treated can and will do as well, perhaps even better, than the model centres, which the Indian cultivator has set up and copied as his ideal.

All this, you will be told, must cost much money. To this the reply can quite well be made. Yes, it will cost money, and a great deal of it, in the same way as the war is costing immense sums of money. The expenditure, however, is equally necessary and for the same reason, *viz.*, that without it, the Empire cannot go ahead, but will go back, and since this is so, why delay? Has not India as a nation got sufficient wealth to invest in such an undertaking and to wait during the comparatively short period that must elapse before the profits, those very substantial profits, come back to the investors? Will not the capitalists, even the Government itself, have excellent security for any advances made since the land, well cultivated and looked after, is of greater value than neglected areas? We are told that it is very difficult, almost impossible, to wean the native from his land; since this is undoubtedly true it should render the task before us somewhat easier of achievement, for the land is not there to be wasted, and so, as already pointed out, if the *ryot* wishes to keep his property and not have it taken over by the State, until some heir or more capable owner inherits it, he must bestir himself and prove worthy to own so useful a property in the same way as the princes and the highest English officials have to prove themselves worthy to carry out the tasks that their high positions demand of them. Such men, as every one knows, make mistakes at times as does every one unless he is too perfect to remain on this earth, but when they

do, they know the consequences and expect and ask for no mercy; recognising their error they resign and so forfeit their positions. If this is the case with the highest in the land and since all are equal in the eye of the law and of practical politics, why should an idle, stupid or self-willed land-owner or cultivator, just because he is of microscopic importance as individual (but of great importance in the aggregate), not have their lands taken from them and so forfeit their positions also when they cannot or will not mend their ways and prove of average utility to India and the British Empire as a whole.

AGRICULTURAL CO-OPERATION.

BY MR. R. S. VAIDYANATHA AYYAR, B. A.

AS I have already pointed out in my previous article on this subject, published in the October number of this *Journal*, it will not be possible for individual members or single societies to derive the fullest advantage of membership unless they combine together to form larger associations under expert management; for it is only by such combination that they can exercise an effective influence over prices and quality of commodities. The central organizations can employ their own analysts, appraisers, and machine experts and deal directly with wholesale purchasers and thus minimise the risk of fraud and speculation.

Mr. Cahill observes:—

"The concentration of the demand of several hundred societies for each of these articles enables a central association to purchase in bulk at favourable prices and when as in the case respecting the purchase of certain articles over forty large associations counting a membership of over a million farmers are united, their influence on prices is substantial. In one year the Supply Association

of German Farmers, of which the Imperial Federation is a shareholder, has purchased at preferential rates 620,000 tons of basic slag; and the Potash Supply Company founded by the same Federation, which in 1911 made a five years' contract on very advantageous terms with the Potash Syndicate, purchased in the year 1911, 120,000 tons (as against 105,000 tons in 1910) of purified potash salts."

These remarks apply equally well to the purchase of machinery also. The concentration of the demand in the manner indicated above will enable manufacturers and importers to regulate their out-put to the demand, to save a large portion of their expenses in advertising their machinery and in paying commissions to district and local agents and to supply machinery to central organizations at very much reduced prices.

The area of operations of these central supply associations corresponds with that of the unions to which they are affiliated. There are four central organizations for the Rhine Province at Bonn, Cologne, Coblenz and Treves; three for Silesia and Brondenburg at Breslaw and Berlin respectively; in West Prussia, Posen and Pomerania have two each, Baden possesses two at Carlsruhe and Freiburg and there are four working in Bavaria.

Ordinarily membership in a central supply society can be acquired only by local co-operative societies and persons forming the Committee of management and the Board of supervision, but occasionally it is extended to individuals who show adequate cause for not joining a local supply society.

As membership in a central supply association is ordinarily limited to local societies, the nominal value of each share varies from 10s. to £75, while the liability per share ranges from £2-10-0 to £500.

The cost of management is generally very low, the average for twenty-seven central associations in 1910 being only 1.37 per cent of their total purchases and sales. The highest percentage was shown by the Strassburg

Association which was 4·6 per cent or £ 7,590; in two cases (Kiel and Wiesbaden) it was slightly over 3 per cent or £6,270 and £725 respectively; and in five cases it exceeded 2 per cent. There were eight organizations whose expenses did not amount to even 1 per cent.

The following table shows the financial position of the central organizations attached to the Imperial Federation at the end of 1911:—

Number of central organizations in the Imperial Federation	33
Total of societies and individual members affiliated	12,738
Total shares held	27,867
Total share liability	£ 1,993,525
Total assets	3,245,273
Total liabilities	3,121,740
Profit	128,379
Loss	4,845

COMPOSITION OF ASSETS.

Cash, bills and effects	£ 209,168
Goods	375,396
Real and moveable property	411,588
Various outstanding assets	2,249,120

COMPOSITION OF LIABILITIES.

Paid up capital of members	£ 637,063
Reserve	110,410
Working reserve	212,389
Total owned capital	959,852
Borrowed capital	2,161,877
Relation of owned to borrowed capital	100,225

GOODS SUPPLIED DURING THE YEAR.

	Tons.
Manures	1,613,000
Feeding stuffs	639,520
Seeds	26,844
Coal	1,220,000
Others	107,000

Total value of goods sold ... £ 14,681,680

The object of the Machine Societies is to purchase all kinds of agricultural machines, moveable grist mills, steam ploughs, straw

pressing machines, drilling, sowing and weighing machines, and meadow rollers, etc., for the common use of the members. These societies require considerable capital outlay as the price of machines is generally very high, the cost of a threshing machine alone being about £500. Small societies with a membership of 20 or 30 men cannot afford to purchase such costly machines with their share capital, of which only a portion is paid up. The usual practice for these societies is, therefore, to borrow the necessary capital either from the local credit society, the local public savings bank, or perhaps from the Central Co-operative Bank of the union to which the society attaches itself. Such loans are usually made subject to annual sinking fund payments.

The members are obliged to take shares either according to the size of their holdings or according to the number of hours for which the use of the machine is required, the former alternative being more generally adopted than the latter. In the case of a threshing machine costing £ 500, it might be necessary to obtain £ 480 from an outside agency, e.g., from a Central Bank, which normally makes loans to societies up to 25 per cent of their collective liability. The collective liability must therefore be brought upto £ 1,920, and the number of shares to be taken, if each share carries a liability of £ 10, is 192. But the average number of members in German registered threshing machine societies in 1908 was only twenty-three. Small membership always constitutes a serious question for such societies, which by adopting the policy of making members taking shares according to the size of their holdings endeavour to bring about a fairly proportionate distribution of the liability according to the advantages to be derived from the use of the machine. The following table shows the nominal value of the shares of these societies with their liabilities during 1908:—

Par value of shares	Total of		With unlimi- ted liability.		With limited liability			
	Societies	Members	Societies	Members	Societies	Members	*Addi- tional shares	Total liability.
								£.
Up to 1s.	14	185	3	52	11	133	3,027	13,226
Over 1s. up to 2s.	7	223	1	39	6	184	158	3,100
„ 2s. „ 5s.	39	1,036	9	379	30	657	1,288	22,236
„ 5s. „ 10s.	61	1,356	18	414	43	942	585	30,920
„ 10s. „ £ 1	26	776	6	156	20	620	698	16,118
„ £ 1. „ „ 2-10	62	1,468	26	548	36	920	843	17,978
„ „ 2-10 „ „ 5	111	2,403	48	918	63	1,485	581	26,115
„ „ 5 „ „ 10	42	836	19	331	23	505	66	9,439
„ „ 10 „ „ 15	17	307	9	149	8	158	261	6,100
„ „ 15 „ „ 20	4	90	1	18	3	72	...	2,001
„ „ 20 „ „ 25	9	125	3	34	6	91	...	2,450
„ „ 25 „ „ 30	1	24	...	...	1	24	...	720
„ „ 30 „ „ 40	2	34	...	...	2	34	...	2,415
„ „ 40 „ „ 50	1	8	...	...	1	8	32	4,000
„ „ 50 „ „ 100	1	7	...	...	1	7	...	700
„ „ 100 „ „ 250	1	9	1	9	..	...	...	...
„ „ 250 „ „ 500	1	8	...	...	1	8	...	2,500
	399	8,895	144	3,047	255	5,848	7,539	160,018

* By additional shares are meant shares taken up by members beyond the single obligatory share ; thus the 133 members of the 11 societies with shares up to 1s, held 133 shares, *plus* 3,027 additional shares.

In the case of societies which had adopted a limited liability, 154 societies had prescribed a liability of one to ten times the nominal value of the shares, 54 from ten to fifty times and 47 over fifty times, while 65 per cent of those with over ten times the liability had shares of 10 s. and under. The average liability incurred by members of such societies amounted to £ 27-7s. In the case of societies with unlimited liability, the co-operative credit banks require evidence that

the total property of the members is ample to cover the loan.

The success of a Threshing Machine Society depends almost entirely upon the sufficiency of the threshing hours prescribed at specified rates. For instance, a society which has borrowed £ 500 at 4½ per cent repayable in ten years to purchase a threshing machine will have to incur the following expenses:—

	£.	s.	d.
Interest on £500 at 4½ per cent	...	22	10 0
Ten per cent towards repayments	..	50	0 0
Payment of machine	...	25	0 0
Other expenses	...	15	0 0
Total	...	112	10 0

In order to meet these expenses it is necessary to fix an adequate number of working hours at rates which would not deter farmers from using the machine. For example, 500 threshing hours would be required at a rate of £ 0-4-6 per hour, while 550 hours would be required at £ 0-4-0 per hour. Unless great caution is exercised in the regulation of the hours, friction is likely to arise owing to the difficulty of meeting every one's convenience. When the machine is not moveable, many societies allow the use of the machine to its members according to the date of receipt by the Committee of the request therefor. But at the beginning of the threshing season the members use the machine only for a proportion of the time stipulated, in order to give every member an opportunity to renew his supply of straw. If the machine is transportable, members in the same locality are required to use it consecutively so as to avoid waste of time and cost of transport. When the machine is transported to the farms of larger landholders, the smaller farmers bring their corn to the machine shed. Members are often tempted to resign partly with a view to avoid liability and partly because the non-members enjoy all the advantages of the society without the risk. With a view to prevent such abuses on the part of members, a fairly high entrance fee is sometimes demanded and a long period of notice of retirement from membership—the Act prescribes a maximum period of two years—is insisted upon. The same general principles apply to all societies dealing with other kinds of agricultural machines.

The question of the development of corn-selling on co-operative principles had attracted considerable public attention in Germany

even in the early nineties and had, in fact, become so important as to induce the Government of the country itself to take direct action in the matter by grants, advances and other means. The advantages of the co-operative sale of corn are well described as follows in the preamble to the Prussian Act:—

1. Improved facilities for cleaning, drying, classifying and mixing the various grades of corn delivered so as to furnish commodities at once good, homogeneous and easily marketable.
2. The possibility of regulating prices by only putting commodities on the market according to actual demand—in other words, the reservation of supply.
3. The possibility for farmers to obtain credit on fair conditions on the security of their warehoused corn.
4. The abolition or reduction to as great an extent as possible of the charges of middlemen and the reduction of the cost of transport.

Great cities, mills and breweries requiring supplies on a large scale generally desire to deal with as few supplies as possible and unless the supply is also concentrated in as few centres as possible and is properly regulated to meet the demand, small farmers will not be able to secure the best advantages of price.

In Prussia, the State allotted a sum of £250,000 in 1896 and 1897, for the building of granaries near or on suitable Railway stations and water-ways and constructed about thirty-six granaries out of this fund; thirteen in Pomerania, six in Hesse Nassau, three in Saxony and Westphalia, two in Posen, East Prussia and Hanover and one in Silesia, West Prussia, Rhine Province and Hohenzollern, the remaining one being built at Berlin as an experiment institution under the administration of the State. They were leased to co-operative societies on condition of paying interest upon the capital outlay expended by the State for their establishment and maintenance at 1 per cent in the first and second years, 1½ per cent in the third year, 2 per cent

in the fourth year and $2\frac{1}{2}$ per cent the fifth year, or 8 per cent spread over five years. Further, three-fourths of the profits realised during this period were paid to the State subject to the limitation that such payments out of profits, together with the interest just referred to, should not exceed a rate of 3 per cent per annum on the capital expenditure for establishment. These societies require on the part of their committees firmness in dealing with members as regards price, delivery of corn, knowledge of price movements and ability to find markets.

Five out of the thirteen Pomeranian societies paid to deliverers in cash 75 per cent of the value at current prices and the balance after the close of the accounts of the financial year. The value of the corn was first determined on delivery by the Committee of each society. The balance at the end of the year was distributed on the basis of the average price realised for all sales of a particular commodity, each member then receiving the excess over the advance of 75 per cent already made. But as this method made no distinction between deliveries of superior and inferior grades, members were subsequently paid at the end of the year the remaining balance of the price of their particular delivery. The remaining granary societies of Pomerania sold the produce of their members on commission. One society reported that combination for co-operative sale of corn was of great value in giving farmers the means of warehousing and cleaning their corn, while raising money against it until prices become favourable; these advantages were especially appreciated by the small land-owners who, when their small deliveries have been graded, mixed and sold in bulk, obtained the same prices as large farmers; whereas, previously they sold small ungraded lots and were practically obliged to accept the prices offered by the local merchants. Another important society visited by Mr. Cahill reported that the prices obtained by the members were superior to those paid by

factories and on the day of his visit there were six steamers of 600 to 900 tons either taking or discharging cargo at the warehouse of the society.

In Hasse Cassel prices are fixed daily by Cassel office and members are paid in full on delivery at their society, any dispute by a member in regard to the price so fixed being referred to the weekly meeting of the Committee of his society. If members desire, their corn is sold on commission or warehoused and loaned up to 75 per cent of the current market price. The whole of the book-keeping and finances of each society are managed by the central office, one clerk being specially detailed for each of the six societies and the central society also takes stock regularly at the local societies and audits the accounts. The organization in Hasse Cassel is such that the local societies merely handle the cereals, the determination of the prices and the commercial side of the business being generally undertaken by the central office.

Unlike those in Hasse Cassel the societies in the Province of Saxony are independent of any central management, each operating its own account. All the societies have limited liability and each member is obliged to take shares according to the area of his cultivated land. It is usual to appoint a farmer as co-manager with the paid Secretary who is generally a person of commercial training. The societies buy directly, paying cash to deliverers, but members are also allowed to warehouse their cereals and obtain advances upon them. All the societies sell manures, feeding stuffs and other agricultural requirements; because as the margin of profit on the sale of cereals alone is small, few societies could make sufficient profit without adding this branch of business.

The Halle Granary Society in Saxony proved, however, a failure. Dr. Rabe gives the following reasons for the non-success of this society:—

(1) It was one of the first to be established in Germany and its granary was too large, being in fact the largest to be built and the cost of its upkeep was very great. Lack of experience was thus largely responsible for the failure.

(2) The machinery equipment was very wasteful; for instance, to handle even a hundred weight of grain all the motors had to be set working.

(3) The area from which the members were drawn was too extensive; some members lived about 80 miles distant.

(4) The original working capital was too small (the shares being only 5s.) in comparison with the turn over (about £20,000) with the result that interest charges were unduly heavy—in one year, £2000 was paid as interest upon borrowed capital.

(5) The society did not sell manures, etc., during the earlier part of its existence.

(6) Mismanagement in certain directions, for instance, by holding excessive quantities in stock.

Dr. Rabe observes that in spite of its non-success the general influence of the society had been beneficial to the farmers in various ways, especially as regards improving prices and making corn factors more amenable.

The Bavarian societies possess some exceptional importance inasmuch as small and medium holdings predominate largely in that Province as shown below:—

			No. of holdings in 1907.
Up to 5 acres	...	...	241,642
Over 5 upto 12½ acres	...	...	162,431
„ 12½ „ 50 „	...	...	224,640
„ 50 „ 250 „	...	...	46,663
„ 250 acres	...	...	583

As compared with the societies in Pomerania and Saxony, the Bavarian granaries are built upon a small scale and each is designed to serve only a small area. The site of the majority is so chosen that farmers may be able to bring in their corn from their holdings in two or three hours. In 1911, 166 granaries had been built at a total cost of £165,690. The bulk of them, however, are not conducted by special corn-selling societies; ninety-four were conducted by rural credit societies, twenty by unions of co-operative societies, ten by agricultural district associations, one each by a commune and by a peasant association, and two by private persons, the

remaining 38 by “Granary societies and by purchase and sale societies.” The Bavarian Ministry of the Interior has given considerable assistance to these undertakings either by grants or loans on easy terms. The following conditions must be complied with in order to qualify for State assistance:—

1. The Association must become a registered Co-operative Society or if this should not be feasible, the association and its members must expressly undertake liability for the loan.
2. The use of the granary must also be permitted to farmers who are not members on payment of suitable fees.
3. The granary should be provided with proper equipment for cleaning and grading corn.
4. The equipment and contents of the granary should be insured.
5. The association must draw up and present to the State authorities its articles of association and business regulations.

Down to the end of 1907, the Bavarian Government had awarded a total of £9,177 in free grants, and of £42,949 in loans for the building of granaries, £450 at 3 per cent, £34,595 at 2 per cent, £5,075 at 1 per cent, and £2,829 without interest. The State has refused to advance working capital to the societies, but has sometimes postponed the payment of the interest due. Besides this direct financial assistance, the State has authorised the Royal Bank to make advances against cereals deposited in granaries. The Ministry of War has issued an order to the Army Service Corps by which the latter must purchase wheat, barley, rye, straw and hay from dealers only when the supplies cannot be obtained from co-operative granaries. Cavalry and other regiments are also instructed to deliver the waste of their barracks to members of co-operative societies on advantageous terms. The Ministry of the Royal House and of Foreign Affairs give the necessary sites on railway lines gratuitously for building the granaries, and Railway Administrations are also asked to incur expenses upto £500 to connect the granaries with their lines.

In Wurtemberg most of the small societies do not build large granaries at high cost but transform an already existing building according to their convenience the State granting £20 to 30 towards the cost, or the commune placing the necessary building at their disposal. In this province as well as in Baden it is a rule that all members should deliver all their corn to their society, but in practice it is extremely difficult to enforce the principle or to exact the penalties for its violation. Members sometimes prefer to dispose of their production as they choose, especially the larger farmers who by reason of their larger sales and the relatively smaller cost of time or expense in marketing are in a better position to make terms with dealers than small farmers. No society can, however, conduct its business profitably without "co-operative loyalty" on the part of the members and even in cases where the society is assured of a certain proportion at least of the production of its members, the danger arises that the inferior corn will fall to the society, the better corn being sold to dealers at good prices. Members become then dissatisfied with their societies when they do not obtain similar prices for the inferior articles.

Speaking about the general advantages of co-operative corn-selling Dr. Grabein observed in 1908:—

"It has removed the previous relations of dependence upon dealers; it has improved the conditions of sale in the interest of the sellers; by reason of the cleaning, warehousing and drying of corn, it has led to a betterment of its quality; it has furnished the possibility of warehousing corn and raising money on it, while awaiting a favourable term of the market; by the bulking of scattered supplies into large quantities of like grades, it has eliminated small dealers and made possible the seeking of the most favourable markets, thus bringing about an essential improvement on the former monetary returns of corn. Finally, through the care of the societies for a better cultivation of the soil, for the cleaning and selection of seeds, as well as for securing greater uniformity in their quality, a considerable improvement in the technique of production is to be observed."

GENTLEMAN FARMING IN MYSORE.

BY MR. A. REA, F.A.S. (Scotland).

SOME months ago, the Mysore Government instituted a scheme of Gentleman Farming in the State. I have not heard of its success or otherwise, but my experience of about twenty-three years may be of some interest.

Mysore has a wonderfully adaptive climate, and almost any plant from the temperate or tropical climes can be successfully grown. Yet, although this is the case, one has only to take a tour by road or rail through the State, and it will be seen that apparently more than a half of the ground is waste or uncultivated. Even in certain directions, in the immediate neighbourhood of Bangalore, it is only the low lying ground that is under cultivation: the high land is lying waste or used for grazing village cattle. It may be noted that the general contour of the ground throughout the State is a succession of mounds and hollows. As water is usually only got at a considerable depth below the surface, the low lying lands possess advantages in this respect which are denied to those of higher elevation. But if water be available, most plants can be luxuriantly grown there. I know this from my own experience, and any one can see the magnificent trees and shrubs which grow luxuriantly in the High Ground of Bangalore. This latter place is typical of the high lands throughout the State; but these latter are, as I have said, generally lying waste. There is no reason why they should be. There are, however, disadvantages, especially as regards trespass by the hordes of semi-wild village cattle, and I will further refer to these presently.

The Government scheme is an admirable one and it is a wonder that it has not been

advanced long ere this. I am unaware as to whether farming in its ordinary sense is the intention or if it be fruit farming. My experience is chiefly with the latter, but I have at times had some of the ordinary crops of the country grown, such as ragi, cholem and gram, and I have found that if I did the cultivating myself, by means of paid servants, the expenses just about balanced the receipts from the sale of the grain. The ordinary ryot, with a small extent of ground, can provide himself, family and cattle with food, and leave something over for luxuries; but he and his family do all the work themselves, and paid workers are not employed. With others who have a greater extent of land, the usual procedure is to hand over a piece of the ground to ryots who do all the cultivation. The grain is then equally divided between the cultivating ryot and the landlord. The latter can then make some, but a very small profit. Unless there is a very large extent of land, the result is little more than a hand-to-mouth existence, for the indigenous grains are very cheap, and under ordinary conditions, such profit as can be got is scarcely worth considering. This being so, I do not think it will pay gentleman farmers to undertake it.

Then to take fruit farming, my experience is, as far as I can learn, typical of that of many others. First of all, I must state that, being in service elsewhere, I could not take much of a personal direction of affairs and could only visit the property at intervals. The work had therefore to be carried on by maistries. I have tried village officials, ryots, pensioned sepoy and various others, but never got one who could be thoroughly trusted. After a time they came to look on the property, much as if it were their own. They grazed their own and the village cattle inside, utterly regardless of young growing grafted mango and other plants; and by this means and other cattle trespass, I have lost about an average of 60 per cent of the fruit trees I planted. For instance, I once got 1,000 grafted mango plants for which the

first cost in Bangalore was Rs. 1,500. The surviving plants number about 300 or less. In one of my estates there is a field or fields of twenty-seven acres, in which there are over 700 grafted mangoes. This is regularly used by villagers, much in the same way as if it were a public grazing ground. These trees present much the appearance of umbrellas, as they have lost all their lower branches owing to the depredations of goats, usually wilfully-driven in to graze. I fully planted up the whole of the ground referred to with part of the 1,000 mango plants, but I think there is scarcely a single plant of these remaining. This ground, it must be remarked, has a high aloe hedge of twenty-three years growth. But this is no obstacle to the herds or the cattle, for the former cut openings for the latter and remain concealed outside, till they see some one coming, when they enter and drive the cattle out. This usually only occurs during the hot weather when the ryot's fields are bare and the cattle are often sent out to go where they like and wherever they can get anything green, be it plant or tree or grass. In the cultivating season, the cattle are tended by herds, as the ryots' own crops must then be guarded. These depredations during the years I have had these estates have, I calculate, cost me several thousands of rupees. It may be stated that there are the trespass laws, but these are quite ineffective and require drastic amendment. The greatest damage is done by the droves of half-starved cattle kept by the villagers to produce manure. They sometimes amount to several hundreds, and are semi-wild. It sometimes takes half-a-dozen men to catch one of them and even when it is caught it has to be hauled some miles to the nearest pound. The men taking the cattle, waste about half a day, and there is no advantage to the impounder whatever. In the meantime when the drove has been disturbed in its grazing in the estate, the whole body of cattle rush madly for the nearest hedge, recklessly trampling down young trees and knocking the fruit and branches of larger trees. It may be said that there is a civil remedy by an action for damages, but where the ownership of the cattle is distributed throughout the village, it would be difficult if not impossible to apportion the damage done by each animal, though it is often very considerable. The chief though not the only

cause of cattle trespass is the scarcity of grass on the grazing lands. Many of these are so in name only, for they are simply stretches of hard, bare gravel from which the surface soil has all been washed off. The only grass there is, is around the thorny jungle plants which grow on these barren lands. Yet it is possible to improve them and produce a more plentiful crop of grass. The gravel and intermixed red soil is about as hard as rock in dry weather, but it is quite soft and workable after a few showers of heavy rain. The best soil generally is found in the level land at the top of the slopes, and in the hollows at the bottom. The slopes themselves are in the worst condition, as they retain no soil except that found around the jungle scrubs vegetation. The rest is washed away by the rain. This could easily be prevented by running cross trenches across the slope at short intervals. The best and simplest way to do it, is by the plough in the first instance, and then have the loosened soil banked up by spades. The improvement in the soil and the increased growth of grass would be apparent in a short time. Even with sloping ground where crops are grown, this method should be adopted.

But to return to the subject of maistries. A really good one is a first essential, as though the Kanarese labourer is a hard worker when closely supervised, he is extremely indolent when left to himself. This, of course, does not refer to his own private work done by himself. Then again many, if not all of them, carry off a few fruits or seeds every time they leave the estate. There is never any large theft, but when petty pilfering is continued week by week and month by month, the result is something considerable.

Then as to the disposal or sale of fruit and other crops, these are usually bought by contractors who, in my experience, take about three-quarters of the profits, leaving the remaining quarter to the grower. The contractors combine and keep down prices, and the only remedy would seem to be a central bureau where a fair average price would be paid, such as they have in some of the fruit growing States of America. Much might be done in the way of preserving and exporting mangoes and other fruits and Mysore should then become the Garden of India and other parts of the world.

TILE-MAKING IN MYSORE PROVINCE.

BY MR. E. A. BURROWS,

*Tile Expert to Mysore Government and
Member of British Institute
of Clayworkers.*

TILE-making in Mysore, viz., the manufacture of Mangalore and Model Interlocking Roofing Tiles, appears to be divided into three distinct methods of manufacture. First, the cottage industry. Secondly, the small factory of limited capital, and thirdly, the larger factory with up-to-date machinery and plant. The reason for dividing them into three distinct divisions is that the manufacture of tiles in each division is carried on by different methods.

Cottage Industry.—Although I have visited many places in Mysore where tile-making is carried on as a cottage industry, I can say that both theoretically and practically such an industry should not exist. The cottage industry for the manufacture of flower-pots and chatties no doubt fulfils a local want and justifies its existence, but the manufacture of interlocking tiles is a specialised manufacture and needs special plant and machinery which is entirely beyond the reach of the owners of these cottage industries, and with their limited plant the finished manufactured article is wholly wanting in the qualities a good tile should possess, and it is a waste of time visiting these factories as advice given can, for obvious reasons, never be carried out.

A description of a typical cottage tile-factory is as follows:—

The clay is ground by a stone roller which runs round on a circle of flat flag stones drawn by bullocks, in the manner of a mortar mill, with the result that the quality of the clay cannot be guaranteed free from stones

or hard lumps. Even one piece of stone one-fourth inch diameter is enough to cause the destruction of the tile into which it is incorporated. As to the quantity of clay ground, it is ridiculously small. I have seen a good pug-mill or clay-grinding mill in an up-to-date factory grind as much clay in twenty minutes as this bullock mill will grind in twenty-four hours, with the certainty that the clay contains no stones which will damage the tiles.

The rest of the plant is on a par with this. There is usually one hand press; this press is the most costly part of the plant of the cottage factory, and may cost about Rs. 600 if purchased new. Then there are the tile-drying frames which are more often than not quite useless for drying straight tiles on, being made of any kind of timber which comes to hand.

Then regarding the kiln, it is usually of the most primitive type and in some cases only consists of four thin walls in which it is a wonder that any heat at all can be obtained, and which violates all the recognised principles of burning tiles. So it is no wonder that the burnt tiles are absolutely useless for good building work. As to any profit from the manufacture of tiles by cottage industries, it is practically non-existent. Tempted by high prices in their locality and by the difference in the cost of manufacturing tiles and the sale price in up-to-date factories, people start these small cottage industries, hoping for large profits, but they do not take into consideration the bad quality of the tiles when produced nor the losses in manufacture by these wasteful methods, so that the hoped for profit turns out a dead loss.

The Factory with Limited Capital.—By this I mean the owners of tile factories with a capital of Rs. 50,000 approximately. With such a capital first-class tiles may be manufactured, and even good profits can be obtained provided the local demand is good and reasonably good prices be got for the

tiles in the local markets. Of course, the output of tiles is strictly limited and in the most favourable conditions would not exceed one lakh of tiles monthly.

From the profits they may also gradually enlarge the factory, but there is one consideration which makes it unwise to recommend this type of factory, and that is that they can never compete in open market with the up-to-date type of factory with a commencing capital of one-and-a-half to two lakhs. This second type of factory is limited. It may be up-to-date in its motor power, its presses and its drying arrangements, but once this type of factory is decided on and built, it means that if in later years the firm wish to extend their factory and bring it up-to-date, it can only be done at the expense of pulling down the kilns for burning tiles and building an up-to-date continuous kiln, in place of the small kilns of intermittent type. This is a serious matter and means a tremendous loss to the firm, and yet the difference in the cost of burning tiles in the latest continuous kilns and the small intermittent kilns is so great and the advantages in other ways so many that the cost of a continuous kiln can be covered in two or three years through more economy in working costs. For instance, the cost of a continuous kiln is between Rs. 20,000 and Rs. 30,000 according to the size of the continuous kiln including a tall chimney, 120 to 150 feet high, and the Drying Sheds which in this system are built over and around the continuous kiln so as to take advantage of the heat radiated from the kiln during burning will cost from Rs. 20,000 to Rs. 30,000.

Such a kiln and drying shed will burn tiles with an expenditure of 7 cwt. to 8 cwt. of wood fuel; whereas the kilns in the smaller factories of intermittent type burn approximately 20 cwt. of fuel per thousand tiles. Taking wood fuel at Rs. 10 per ton as in Mysore, the saving, at at least Rs. 6 per 1,000 tiles on an average output of two lakhs of tiles per month, would be Rs. 14,000

annually. Another consideration is that by using one-third the amount of fuel, the cost of fuel is not likely to rise so much in value. It is already a very high rate in Mysore City, Rs. 10 to 12 per ton, whereas in the factories on the West Coast it can be procured for Rs. 5-8-0 per ton. This also affects the poor people in the districts and is a good reason why the second kind of factory with limited capital should for economic reasons not be allowed.

The factory with limited capital has also to put up with further disadvantages, as this type of factory is usually a scattered arrangement of kilns and drying sheds. The transport costs are very heavy, also the work is not regular; one day a lot of tiles will be unloaded from the kilns, the next day nothing. Losses in transport and irregularity of working may easily reach Rs. 5,000 annually, on two lakhs monthly, which brings the total losses up to Rs. 19,000 annually, between two factories of equal output of twenty-four lakhs annually, one factory working by gradual extension and intermittent kilns, and the other factory well planned out at the beginning with the full capital of one to one-and-a-half lakhs of rupees. With all the above considerations in view, it is both wasteful and very risky to start a tile works with a small capital.

The Third Type of Factory.—With a capital of Rs. 100,000 to 150,000, it is all straightforward work in the construction and any extension in the future requires no demolition of present kilns or replacement of machinery, as each factory designed on this principle constitutes a separate unit and, if necessary, can be duplicated according to the demand for tiles. One instance of this is Henke's Tile Works, Feroke, on the Malabar Coast. It contains three such units. The only instance we have in Mysore, is the City Brick and Tile Works, Bangalore, containing one unit. The Mysore Tile Works in Mysore City started work as a Tile Works of the second class. Now the demand for

their tiles being very great they are now faced with the aforesaid difficulty of abandoning their present plant and the advisability of building a new plant on up-to-date lines with the full amount of capital required for one up-to-date unit.

Quality of Clay.—In constructing a new factory special attention should be paid to this and only a practical expert's advice should be taken and the prospective company should avoid going to any expense in plant or buildings unless the tile expert can produce good tiles from the local clays. This is the only safe proceeding. No tile expert who values his reputation would advise the expenditure of money on plant and machinery until he could produce for exhibition such tiles. Fortunately in Mysore, through the help of the Mysore Government, such advice is readily available, whereas in most districts outside Mysore, the jealousy of manufacturers makes it almost impossible to get new clays tested under up-to-date conditions. I know a factory outside the Mysore Province with unlimited capital which failed entirely because the advice of a tile expert was not taken at the very commencement before any plant was erected. After a great part of the plant was erected, the advice of a tile expert was obtained and he informed them that the clay was useless to make good tiles, but for obvious reasons at this late stage his advice could not be acted on.

The following Press communique has been published by the Bombay Government:—

As a result of inquiries instituted by the Bombay Indigenous Industries Committee into the possibilities of developing the roofing tile industry in the neighbourhood of Bombay, the following localities have been suggested by the Pottery Department of the J.J. School of Art as being the most suitable places:—Khatalvada in the Umbergaon

Taluka of the Thana Collectorate; Vada, Parli and Gorah in the Vada Taluka of the Thana Collectorate; Marol in the Salsette Taluka of the Thana Collectorate; Panvel in the Panvel Taluka, and Nagothna in the Pen Taluka, of the Kolaba Collectorate; Mandangad and Jalgaon in the Dapoli Taluka, Khed in the Khed Taluka and Rajapur in the Rajapur Taluka of the Ratnagiri Collectorate.

An estimate has been prepared by Mr. Fern, Superintendent of Pottery, J. J. School of Art, for a power factory turning out between 4,000 and 6,000 tiles a day, which is considered to be the least number that can profitably be turned out by a concern of moderate pretensions. It is estimated that the cost of the necessary plant, most of which can be manufactured in this country, would be about half a lakh of rupees, adding 30 per cent to pre-war prices; to this must be added the cost of the site. The cost of running it, including depreciation at 10 per cent, and interest on capital at 4 per cent, would be about the same. The net profits of such a factory, which would work for about 300 days a year, are estimated at not less than 12 per cent.

A smaller factory without power-driven machinery and turning out about 1,000 tiles a day, would cost, exclusive of site, about Rs. 20,000, and could be run at an approximate cost of Rs. 14,000 per annum. It would, however, not be able to work for more than eight months a year and would have to sell its tiles at a higher rate than the larger factory to make a net profit of 12 per cent.

Details of cost of both types of factory can be obtained either from the Secretary, Indigenous Industries Committee, or from the Superintendent, Pottery Department, J. J. School of Art, Bombay, the latter of whom will also give technical advice free of charge.

AGRICULTURE & INDUSTRIES.

BY MR. PADMANABHA IYER, B.A.

LET us address ourselves to the vital question of the hour—"The Relative Importance of Agriculture and Industries." There is, in the first place, a view getting into currency which, having regard to the extremely depressed and deplorable condition of the Indian ryot, holds that agriculture is not destined to keep its own in the long struggle for the industrial future of the country. The inequality and inexpediency of an attempt to enter competition with the manufacturing and industrial enterprise of the West lend, in the next place, their support to another but opposite view, that we cannot ever become industrial. Those who maintain the first view strenuously advocate the diversion of all the capital, labour, and genius of the country to the "new" industrial enterprise, while others who bow to the second view assiduously plead for the transfer of all the capital, labour and genius of the country to agricultural pursuits. Both the parties indulge in fierce invectives and gloomy forebodings, each complaining of the thoughtless, futile and even dangerous schemes suggested by the other. The former must bear in mind that it is suicidal to abandon altogether agriculture, in which the nation excels, and that the nation labours under considerable disadvantages of conditions and surroundings favourable to the successful maintenance and expansion of the "new" industry; while the latter should not forget that it is equally dangerous not to take to the "new" industry which is the hope and anchor of modern civilisation and that no nation has, by following agriculture alone, ever progressed beyond a certain degree of civilisation. Sir W. W. Hunter says:—"India may be truly described as an agricultural, rather than a manufacturing,

country. Yet it must not be supposed that she is destitute of the arts of civilised life. She has no swarming hives of industry to compare with the factory centres of Lancashire, nor any large mining population. But in all manufactures requiring manual dexterity and artistic taste, India may challenge comparison with Europe in the last century, in many of them with England at the present day." Thus any one who is intent on the industrial amelioration and advancement of the country will readily recognise that the continuance and expansion of *both* agricultural and the new industrial pursuits are emphatically warranted by the natural capability of the country. And, moreover, history teaches us that "a nation can hardly be one-sided or monotonous." A great English writer says.—"A huge portion of our (English) industrial activity has been transplanted to the Indian soil." And we have the further assurance by a leading political economist, that "so far as long practice or inherited aptitude is the source of advantage, a policy which protected struggling industries might enable a young country to attain more surely the free independence of industrial maturity, the protection only removed at the proper moment." All this lifts from oblivion the future of the Indian industries. Judged by the rich resources of materials which time-honoured agricultural industries supply by cheap labour on the spot, and by the industrial genius of the country which distinguishes her from other Asiatic lands, that future seems to be full of promise and secure hope of ultimate success. All varieties of manufacturing industries which have furnished the wealth, splendour and material magnificence of many a big city may, with supreme advantage, be borrowed and attempted. For look at Japan. The *Agriculturist* of August, 1892, has the following:—"Of all the industries which Japan has borrowed from abroad, that of match-making has been the most successful. The first factory was established in 1867. It has gradually diminished the import of

that article, while in 1890 there has been an export of the same to the value of £236,000." Japan has now taken advantage of the dislocation of industries caused by the present terrible war and her exports of matches and other articles have phenomenally gone up.

SUGGESTIONS FOR IMPROVEMENT.

The next thing that forces itself upon our attention is the main problem of how best to improve these industries. The methods fall under two heads—

- (i) Those specific to agricultural industry.
- (ii) Others of a general character applicable alike to whatever local industries exist — agricultural, manufacturing, or otherwise.

SPECIFIC METHODS.

1. An able civilian of Madras, looked upon as an authority on agricultural questions, observes with pregnant truth that "land in India, if properly cultivated, will yield six times as much as it does at present." This presses on our notice the adoption of convenient methods of proper and improved production. The absence of large farming in this country and the liberality with which Nature "grants her bliss at labour's earnest call," fully justify the emphatic assertion of the Travancore Census Commissioner that "the want of capital is only an excuse, the want of enterprise is the reality." Recent investigation in that State has proved that there are 1,751 persons who own property liable to a tax of between Rs. 50 and Rs. 100, and 995 persons whose tax rate is above Rs. 100 per annum. 207 persons own wealth of which the yearly income is between Rs. 3,000 and Rs. 6,000. The significance of these figures will be apparent when it is remembered that this calculation leaves out of account the army of Government servants, lawyers and persons who invest their assets outside the State. If sufficient and

sustained enterprise is shown, the land is certain to yield more.

2. There is a tendency among our ryots to bring under the plough every inch of cultivable soil, regardless of the quality of the cultivation. This reckless extension of cultivable area, which the ryot makes in his vain attempt to grow rice at small cost and labour, increasingly diminishes the quality of the return and consequently, drives the ryot often to an extremely deplorable condition. More than 50 per cent of the ryots thus languish fast under an evil which, however, like others of its kind, is in their own hands to remedy. It is, therefore, easy to recognise that discrimination on the part of the ryot to relinquish all third rate and fourth rate lands under cultivation and to cultivate only areas which are "under the influence of increasing if not adequate returns," will remove the evil altogether. This only depends on the conviction that it is better to have few roods of fertile land than large areas of failed or scanty crops! The relinquishment of scanty crops will further secure economy of water-supply, which is to the Indian ryot what, as has been truly remarked, high cultivation is to the farmer in England.

3. If the large tracts in which ill and scanty cultivation is carried on with a solitary desire to increase the estate in extent are profitably thrown out of cultivation, then the large amount of labour and capital wasted away can, with supreme advantage, be employed to emancipate the industry by improved methods of scientific tillage.

4. Another method of improvement consists in the conversion of these relinquished areas into fodder crops for cattle. The lands available for cattle fodder are gradually diminishing. "Over a great portion of the Indian Empire the mass of the cattle are starved for six weeks every year." The ryot should grow all sorts of grass and fodder-stuffs that he thinks these grounds are suitable for. This is the only way by

which to make up for the insufficiency of grazing grounds which is one of the chief impediments to our agricultural industry.

5. The condition of the cattle is very poor. The average annual loss of cattle in India by preventible disease is estimated at ten million beasts! Veterinary knowledge should, therefore, be necessarily largely diffused among the ryots, and proper selection in cattle-breeding should be made.

6. Jungle leaves, green and dry, droppings of cattle, ashes and sweepings form the most generally used manure in this country. But want of manure is often caused by using the cattle-dung for fuel. Plantation of trees in the lands thrown out of cultivation will help far towards securing large supply of manure.

GENERAL SUGGESTIONS.

1. The first and the most important thing necessary for the purpose is to *raise the status of the ryots* by imparting to them instruction useful for the particular industries they follow. The Secretary of State for India, in his despatch of September 1888, in acknowledging Sir Alfred Craft's Review of Education in 1886, wrote that "Government should promote and countenance such technical education of a special character as may be applied to the service of existing industries which will profit by the aid of scientific research, scientific method and high manipulative skill."

2. The trained artisans of each district should unite in fellowship and form industrial organizations. They should localise the industry under the control and guidance of industrial experts, who may be invited and settled for the purpose. It is Professor Marshall, I believe, who remarked that "the mechanical faculty of Lancashire was due to the influence of Norman Smiths who were settled at Warrington by Hagode Lopus in William the Conqueror's time." The village autonomy of our country makes it a matter of easy achievement to form such corporate

bodies, with divisions of one or more of them in each district holding to Government the same relation as a Railway Company.

3. Mr. Sidgwick observes, in his *Political Economy*, that "Such portions of land as are manifestly useful to the community when thrown open free for common use, should be retained in public ownership and under Government management and even in England where this kind of interference is at its *minimum*, gold and silver mines are reserved to the crown." The necessity for industrial rights in India is, therefore, manifestly apparent; other privileges calculated to be conducive to free right of search for minerals and of property in which minerals are found, and to the prudent and successful management of local industries should also be granted.

4. Government Co-operative Societies must spread throughout the country and encourage the movement of all industries by grant of liberal loans. But the only easy and to the Society profitable way, it seems to me, is admittedly in the hands of the people.

5. If instead of investing their accumulated earnings in idle jewels and wicked money-lendings at exorbitant rates of interest, the people will, in the interests of society, agree to divert them into investment of industrial loans, the promise and potency in the creation of the necessary capital are eminently hopeful and realizable. The discontinuance of old-time disabilities, such as extravagant expenditure on marriage and similar occasions, and devotion of the same to this purpose will, no doubt, advance and improve the industries on a huge scale.

6. It is useless to possess capital and control, if we do not put them in union with labour. In this country there is a perversion of charity which breeds multitudes who choose the role of a beggar in preference to that of a workman. Sir James Caird says:—"Plenty of labour can be got out of these mendicants and wandering gypsies of

the East if they are, with one united effort, made to work and earn their bread at the sweat of the brow. This will create a new force in industry which obtains competency without mendicancy and gives equal rewards by equalization of fortunes."

7. To rear the foundation on a firmer basis, it is necessary to maintain industrial organs, like the *Mysore Economic Journal*, for diffusion of prompt and correct information on all matters relating to and affecting the several industries.

8. The holding of exhibitions in various centres will awaken interest and stimulate the industrial arts of the country.

9. An economic and industrial survey of the country is calculated to be productive of far-reaching results that will furnish a secure basis for the development of the material resources of the country. It will help in the localisation of existing industries, the ascertainment of the conditions in which they exist, the adoption of the means and methods by which those conditions might be improved, the introduction of new industries with reference to the extent and resources of the country, the removal of the various anomalies that disfigure the economic aspects of the country and press more or less upon the strings of industry and the elevation and emancipation of our industrial status.

It is reported that a project for the establishment of a cotton spinning mill in Corea has almost matured, and application for permission to form a company will shortly be lodged with the Government. This will be the first cotton spinning mill to be established in Corea, and it is estimated that 20,000 to 30,000 spindles can be kept busy on Corean cotton mixed with imported Chinese cotton.

A SOCIAL SERVICE EXHIBIT, MADURA.

BY MR. ALBERT J. SAUNDERS, M.A., F.R.,
ECON. S.,
American College, Madura.

Madura Social Service League. Public Welfare **Exhibit.**

Models
Charts
Lectures
Demonstrations

Physical Welfare
Public Health
Economics
Education
Hygiene

VICTORIA-EDWARD HALL.

12th to 17th Feb., 1917.

Watch for other Announcements.

SUCH was the invitation extended to the public of Madura a few months ago in connection with a movement for public welfare. We find this spirit of service everywhere in the world to-day, and it is one of the redeeming features of these awful war times. England was selfish, materialistic, and pleasure loving, but when Belgium was invaded and northern France laid low England roused herself, and for the last three years English men, women and even children have been pouring out their lives and their treasure for the good of others. A new spirit has taken hold of America since she entered the war. Bold indifference has given way to a very real enthusiasm, and America to-day is thinking more of how she can best help the cause of justice, freedom, and right, than of the mere accumulation of material wealth. India too, in the midst of many problems, both economic and political, but both parts of a growing and patriotic nationalism, is showing signs of a splendid social awakening along the lines of a public welfare. A strong background of public opinion for social welfare must be developed before the reforms which are so much needed are possible.

We in Madura have recently had an experience of this spirit of social service. It is a tremendous factor making for democracy, for we had working side by side—Brahmins, and non-brahmins, Government officials, municipal councillors, vakils, merchants, educationalists, Y. M. C. A. men, missionaries, men of different colour, caste, creed and social standing. All barriers were broken down in an effort to serve the community. We were glad to have such a spirit dwelling amongst us and we hope that that desire to help one another will long remain with us. Social service for community good is the kindly spirit of our time, and we all will do well to encourage its coming and to aid its operation for our common progress.

The largest public building in town—the new Victoria-Edward Hall, was secured for the exhibit, and to this place for a week thousands of Madura's people came day after day. The exhibit was conducted under the auspices of the Social Service League of the city, and if it were proper here I should have to name dozens who took an active interest in making the undertaking such a success. Co-operation was the watchword of the League members, and efficient organization was the means used.

The questions of finance and publicity were carefully considered. A budget of Rs. 500 was drawn up, to be raised by public subscription. No charge whatever was made for admission, the educational value of the undertaking was felt to be the first consideration. The fact that such a large and successful exhibit could be made for such a small sum of money shows the splendid co-operation and organization. For advertising purposes three hundred large posters were placed throughout the city, then the schools and the press were used extensively to make the exhibit known and to create interest. A large number of the leading citizens were sent special invitations for the opening ceremonies, and handbills for each of the days following were distributed

at the hall, and from house to house, by the volunteers of the Social Service League, who did splendid work both in the matter of publicity and in controlling the crowds.

A public welfare exhibition would be incomplete if the means of cultivating health and strength as the primary basis of all social welfare and efficiency were not especially emphasised. In a country where climate and environment predispose to weakness; and people succumb so quickly to fevers and infectious diseases because of low standards of health, the need for a sound gospel of physical education, through which vitality and the power to resist disease may be increased, is especially urgent. The large place given to problems of sanitation, health lectures, and practical demonstrations of physical activities of the Madura Exhibition was, therefore, of tremendous value. Mr. E. E. Saunders, the Australian physical expert, threw his enthusiasm and ability into organizing health propaganda, training boys from the various High Schools for demonstrations of games, and lecturing on the need for play grounds, with most successful results. Large crowds, including many prominent Hindus, attended the demonstrations, and as a result the municipal authorities enthusiastically endorsed a model play ground scheme for Madura.

It has already been said that the exhibition was held under the auspices of the Madura Social Service League, but that does not express the whole extent of the co-operation. The District Magistrate and Municipal Chairman were active promoters. Then the Department of Public Works, which is engaged on a big scheme of deep drainage in the city, co-operated splendidly by means of an effective exhibit and demonstration of peons, apparatus and so forth. Exhibits were also received from the Municipal Council, the local Health Officer, the Colleges, the local Agricultural and Industrial Association, the Madura Economics

Association, the Madras Y. M. C. A. Graduates' Association, the Eye Infirmary and the Tubercular Institute in Madras, and the Bombay Social Service League.

The real object of the exhibit was two-fold. It aimed to be both educational and inspirational. The ambition in mind was to give information to public-spirited people, and to inspire others to become public spirited. The exhibition was not intended to be a mere entertainment, although not a little effort was expended in seeking to make it interesting and attractive.

The hall was divided into booths or stalls in which were all manner of charts and diagrams and drawings illustrating problems and remedies of city life. Some of these booths illustrated problems common to cities all over the world, such as the fight against tuberculosis. Others illustrated problems common to India as a whole, such as better town and village planning, more widespread education and the prevention of such epidemics as malaria, small-pox, cholera, and plague. Again some exhibits showed methods rather than problems; such were the stalls demonstrating the work of the Madura Drainage Division, and the exhibits illustrating co-operative credit societies and the work carried on by the Bombay and the Madura Social Service Leagues.

Visitors were invited to study the exhibits, to ask questions, and especially to consider what helpful and practical methods might be used for meeting the needs of Madura to-day and in the future. The exhibition was intended as a stimulus to service by citizens, whether as volunteer workers under the direction of the League, or in the giving of time, money and thought to the solution of our worst community problems.

The sessions were divided into three parts: without in the play ground, games and physical education were demonstrated; within the hall there were tours of the booths and explanations of the exhibits, and a public lecture each evening. The different schools and

various town activities were allotted definite days and times for visiting the exhibition, and at such times parties were taken through by persons able to explain the exhibits, which, of course, added to the interest and educational value of the tour. Each evening a lecture was delivered on some special topic. These lectures came under the three general heads of Economics, Education, and Physical welfare. "How Madura is Fed" and "Mass Education" were arranged for by the Economic Association and the Teachers' Association. The importance of physical welfare was emphasised in three lectures: "Supervised City Play grounds," "Preventable Diseases," and "Physical Education." In addition to these, two afternoon lectures, at which women were especially welcome, were delivered in the vernacular on the "Training of Children" and "Care of our Infants." These were well attended, and as many as six hundred women came together.

As to the results, it is, of course, difficult to indicate definite results. The exhibit was primarily given for educational and inspirational purposes. It showed unmistakeably that co-operation on the part of all classes of the community for social and public good is possible. Social service is a reality to-day and organization makes for success and efficiency. Physical education was demonstrated as the true basis from which to seek the city's best social and economic good. Night schools have been started. Volunteers under the direction of the Social Service League do an excellent work in guarding the health of people at the time of the great Chitri Festival. The municipality has endorsed a model play ground scheme for Madura. These are some of the results which have been initiated, or, in the case of some which were already in existence, greatly encouraged by the exhibit.

I was greatly interested in the economics of the exhibition. That which aids the health and efficiency of a community increases its productive power and that is bound to

better economic conditions and result in greater prosperity. Take such exhibits as sanitation by the Madura municipality, or the fight against tuberculosis or intemperance, or co-operative credit by the Economic Society and we have great possibilities for bettering economic conditions. I would like to see these demonstrations greatly enlarged and extended. The average Indian is not averse to new methods if they can be made to demonstrate greater returns. He wants to be sure first of the returns before he makes a change. He has so little generally to experience with that he cannot afford to take any risks, for he thinks that a certain little is better than an uncertain larger return.

There are great possibilities in demonstration exhibitions for economic improvement. Agricultural co-operative societies should take up this way of showing the advantage of better seed, ploughs like the Massey, manuring, model farms and the advantage of co-operative credit. A progressive municipality should use demonstration to convince people of better habits and customs. Why not set aside one ward and make that a model of city planning, sanitation, fresh air and good water, and use that as an educative force and starting point from which to reach out and remodel the whole town. There is also a splendid opportunity for some large town to develop a model play ground scheme which would not only greatly benefit its own youth, but which could be an example to all other towns. The Government in each district might take up the problem of village planning, and have two or three model villages, situated in different parts of the district, designed for the purpose of demonstrating the advantages of sanitation, wider streets, removal of cattle, pure water-supply, and something approaching beauty and ornamentation for an Indian village. These model wards, play grounds, farms, and villages should then be used as educative influences

and demonstrations to bring the suggested reforms to agriculture, to the village, and to the city in general. Insistent demonstration of the better way is what India needs to-day.

I may quote in conclusion the impressions which one visitor to the Madura Exhibit expressed. He said: "First, it was a distinct revelation of the way in which men of all religions or creeds are willing to unite their efforts in behalf of the common public good. Second, it revealed the fact that the masses are ready and anxious to receive instruction and help in problems concerning individual and community hygiene and sanitation. Third, it showed that the men, as well as the thousands of Madura's boys, and doubtless the girls also, are anxious to see play grounds and play centres established. To me this was perhaps the thing of greatest significance, and very clearly indicated an opportunity which may be followed up.

THE PROBLEM OF SANITARY HOUSING IN VILLAGES.

BY MR. S. SRINIVASA MURTI, B.A.

THE construction of sanitary houses in villages is a branch of village sanitation, and in spite of the earnest efforts put forth both by the revenue and sanitary authorities, has not made much headway. Rules of sanitation have no doubt been introduced into almost all villages, but they have not brought about any improvement in the construction of houses in villages, that is, the ryot builds his house on the same time-honoured models, and though he secures a license makes no adequate provision for the admission of light and air and pickets his cattle in the house itself. The importance of sanitary dwellings has not been brought home to the mind of the ryot with startling

vividness, and so long as this is the case it is unlikely that he will change his habits and outlook inherited from a social regime in which sanitation played no very conspicuous part.

There is a tendency to over-crowding in villages where population is steadily increasing. As accommodation becomes scanty, the neighbouring lands will have to be acquired for its extension. The procedure now followed involves considerable delay. The notification for the acquisition of lands is published by Government, and before this is done, the District Medical and Sanitary Officer will have to be consulted as to the suitability of the land proposed for the extension of the village. While steps are being taken for the acquisition of the land, *takrars* are brought in by interested persons, or if the village is a factious one, the villagers form themselves into parties, one party trying to prevent and the other to accelerate acquisition proceedings. If the occupant of the land proposed to be acquired happens to be poor, sympathy is sometimes felt for him and the acquisition of his land is retarded if not abandoned. Even when all these local machinations are resisted or overcome the formal acquisition proceedings themselves will take sometime to mature. In cases where all these formalities have been gone through, the acquisition is deferred sometimes for want of funds.

When the acquisition is completed, it often happens that the ryots experience some difficulty in procuring licenses for building their houses. As they generally build their houses in summer when their agricultural operations are slack, they apply for licenses to the Taluk authorities in March or April and though the village sanitation rules strictly lay down that licenses should be granted to them within one month from the date of their application, this is not attended to at all, and their applications are allowed to drag on without disposal for months together. The

ryot waits and waits hoping to procure the license at least before the rains set in, but when he fails to get it, he gives up all hope of constructing the house that year.

Sometimes the ryot knowing the difficulty of getting a license, formally applies for it after laying the foundation for the house and building walls with the connivance of the village officials, and if he fails to get it in time, completes the building taking the risk of prosecution. This is the cause of the houses being built irregularly in villages. No prosecution is launched against him, as the sanitary rules above referred to are in his favour, nor is the building ordered to be pulled down even though it may have been built up in contravention of hygienic laws. The ryot is let off with a warning or sometimes with a fine.

Owing to paucity of building sites procurable in the *gam tan*, the ryot often purchases sites in Survey Nos. at a considerable price and applies for a house building license, but it is refused on the score that houses cannot be permitted to be built in agricultural land against the codal rules. To evade codal rules, the ryot sometimes plays a dodge. He applies for permission to erect a farm-house on agricultural land which the rules allow and as soon as this is granted he gradually tries to convert it into a dwelling house. This is how agricultural land close to villages, while apparently paying assessment to Government, becomes, studded with houses built in all manner of shapes and sizes.

Sometimes owing to the vicinity of wet or garden cultivation all round, the village is incapable of further extension.

All the above causes retard the free construction of houses in villages, even where licenses are given in time to enable the ryot to construct the house during the off-season, no attempt is made to see that all the conditions of the license are attended to by the ryot. The ryot produces the license if asked to do so, but betrays ignorance of the

conditions laid down in them. The picketing of cattle inside dwelling houses is invariably the rule as the man has no out-house in which to do this conveniently.

It parts of the Mysore District, owing to the net-work of river channels running through it, the villages have been rendered quite insanitary and malarious by the percolation water of the channels. Malaria is making sad havoc in them. No restriction is laid down to prohibit wet cultivation round villages with the result that the cupidity of the ryot extends it right up to the doors of his very dwelling house. The sub-soil moisture always keeps the surface damp. As the ryot sleeps upon the hard ground with hardly a mat underneath and uses no curtains which he regards as a luxury to be indulged in by the rich, he becomes a speedy prey to the mosquitoes which buzz around him. No wonder he contracts spleen, complains of failing strength and dies as a result of frequent attacks of malarial fever. The problem of malaria-stricken villages is how best to prevent Malaria by providing for drainage of sub-soil moisture or prohibiting wet cultivation around them. To certain villages, both these measures may seem to be inapplicable. The best remedy may be the entire shifting of such villages higher up the channel to some elevated spot overlooking the surrounding country, even though such shifting may involve water inconveniences. Each case of an insanitary village has to be decided on its own merits; no hard and fast rule can be laid down for all. If any systematic work is to be done in this connection, a survey of all villages must be made with a view to their classification from a sanitary point of view.

Suppose it be decided that the sanitation of a water-logged village cannot be improved and that it must be shifted to a different place, how to bring home this fact to the people and induce them to re-build their

houses there? Our people are so conservative in their ideas and habits, so ignorant of the laws of health and sanitation that the mere imparting of a knowledge of the causes of ill-health in the village will not of itself prompt them to leave the village in a body and seek salvation elsewhere. The most cynical of them may be found to utter "Did not my father live up to eighty years in this village? If Fate has decreed that I should die early, not even the Gods can save me from a premature grave. Why should I remove to a different place leaving all my old associations sacred and dear to me, as if a mere change of place can confer immortality upon me?" There are others, however, who do not take this view of a cynical philosopher, but who though actuated by a desire to remove to a better locality cannot do so owing to their slender resources. Their case is really a pitiable one and so far as I am aware there is no Government order extending help to them. My enquiries go to show that what they want is monetary help in the shape of a house-building advance, free grant of sites, and alignment of roads and the sinking of a well at Government cost. Their request seems to me to be perfectly reasonable and there is no reason whatever why Government should not consider their prayers favourably. In fact in the case of villages which have been rendered uninhabitable owing to channels running above them, it certainly becomes obligatory upon Government to assist the villagers to shift to a better locality. In other cases where the insanitary condition is not due to direct Governmental action, Government in the interest of the health of the people should try to create facilities for them, so that they may not be put to the necessity of borrowing large sums and falling into the clutches of the money-lender. This is a matter which deserves the serious attention of Government.

The question of sanitary housing in villages is closely bound up with that of con-

struction of out-houses for the picketing of cattle and the allotment of sites for the storage of manure. Houses in villages seem to be constructed more for the housing of cattle than of human beings and this is because the wealth of the ryot is in his cattle and he loves them as the apple of his eye. But it need hardly be said that so long as cattle and sheep are tied inside the dwelling house where people also live, as is generally the rule in villages, no matter what improvements may be effected in the structure of the house, the health of human being cannot be secured. The provision of separate cattle sheds and sheep pens is absolutely necessary in the interests of the sanitation of the village. If sites are allotted to the villagers, they themselves will construct out-houses. The picketing of cattle inside human habitations must be made penal as otherwise the time immemorial habit of the ryot cannot easily be broken. The tying up of cattle in any one place or in a row of houses renders supervision during night easy, as one or two persons may be deputed every day by turns to look after them.

If ideal sanitary conditions are to be secured, the habit of depositing manure in the backyards of dwelling houses and in the open spaces of the *gam-tan* must be entirely broken. Most of the villages are without sites set apart for the storage of manure heaps. In villages surrounded by wet cultivation, the acquisition of lands for the purpose is rendered difficult by the prohibitive value of wet lands. But if the revenue authorities tackle the problem in right earnest, the question of cost does not offer any insuperable difficulty, as the villagers are in most cases found willing to contribute towards the cost. If the village is a big one, it may require two or three places in different directions to be set apart to facilitate removal of rubbish every day. The places selected must be within easy reach of the villagers. One *gunta* of land is sufficient for

one family and may conveniently be demarcated by the fixing of stones. If all manure be deposited in a single place, steps may also be taken at the same time for its better preservation. The deposit of manure within the *gam-tan* is indeed made penal, but owing to no adequate provision of sites outside the village at a convenient distance and to the laxity in the enforcement of the laws, not much good has come out of it. If the village sanitation rules are to be strictly enforced, the revenue officers, particularly the Amildar, ought to be invested with summary powers to fine any recalcitrant owner of a manure heap up to a limit of Rs. 5 and to confiscate the manure heap to Government. The present dilatory procedure of hauling up a case before the Amildar magistrate and getting a notice issued to the party concerned has rendered the sanitary regulation more or less a dead letter.

Sanitary housing can be secured in villages only if the villagers make up their minds to conform in the building of houses to some type designs approved by the Sanitary Department. They are now building houses on time-honoured lines sanctioned by custom. Mud-roofed houses are the rule in parts of Bangalore and other Districts, while *totty* houses are built in the Mysore District. One feature common to all is the absence of provision for the admission of light and air. Because the villagers now spend much of their time in the fields doing hard work in the open air, they do not feel so much the effects of insanitary dwellings, but all the same the noxious effluvia eat into their very vitals when they spend their time in them. Walls are now built very thick to enable them to sustain the weight of heavy beams, but if type designs are furnished to them, they can cut down their expenditure by using light materials and at the same time secure a smart and neat appearance for the structure.

The villager is now a perfect stranger to whitewashing or colour washing, but it is

hoped that with the progress of education in the village he will imbibe ideas of cleanliness and decency and take steps to beautify his house. In this connection let me ask how many of us have an Englishman's feeling for the home, the sweet home? Till some such feeling is generated within our hearts also, our dwelling places will not become the Home Beautiful but will remain shelters to protect us from wind and rain.

The suggestions contained in this note may be summarised as follows:—

- (1) The proceedings relating to the acquisition of land for the extension of the *gam-tan* should be completed within a period of three months.
- (2) A survey of all insanitary villages should be made by a responsible sanitary officer with a view to their classification from a sanitary point of view and to facilitate remedial measures being speedily adopted.
- (3) Where an entire village is condemned from a sanitary point of view, facilities should be given to the ryots to shift to a healthy locality by the grant of house-building advances, free sites, and hutting materials at concession rates.
- (4) The village sanitation rules should be amended so as to render the ryot who pickets cattle inside dwelling houses liable to prosecution, encouragement being at the same time afforded to him to build cattle sheds and sheep-pens by the grant of sites at a convenient distance from the village.
- (5) To take effective steps for the removal of manure heaps, the Amildar should be invested with summary powers to fine the recalcitrant owner of a manure heap to a limit of Rs. 5, and to

confiscate the manure heap to Government.

- (6) Type designs of houses suited for rural areas should be got prepared and stuck up in each *chavadi* to enable the villagers to construct sanitary houses with adequate provision for light and air.
- (7) The education of the ryot in the elementary laws of sanitation and personal hygiene should be promoted by the distribution of leaflets, delivery of lectures, shows, etc.
- (8) The revenue and sanitary officers should be called upon to make it a point to visit during inspections all newly built houses to satisfy themselves that all sanitary conditions have been fulfilled.

ECONOMICS IN THE WEST.

Development of Imperial Activity.

London, October 9, 1917.—The Government have taken a very important step in the direction of Imperial economic unity by establishing a special department, to be known as the Imperial Mineral Resources Bureau, to deal with the metal and mineral industries of the Empire. The new body will be thoroughly representative of the various parts of the Empire and its special function will be to protect our resources from unfair exploitation and to promote the advancement of industrial interests in the British Empire. This move has long been anticipated and it is made none too soon. Unless the portents of the war horizon are more than commonly deceptive the day is not far distant when we shall have to take up very seriously the question of reconstructing the fabric of

industrial civilisation on new or at least greatly changed lines. It is unthinkable that matters can be allowed to drift back into the old happy go lucky way in which it was peculiarly true that the devil took the hindmost, and yet without proper machinery for co-ordinating and developing our matchless resources there is nothing to prevent a fresh strangle hold being placed on the vital key products by Germany or some other power equally ambitious. Properly directed the new Bureau will be a power for good to the Imperial interest and at the same time be of inestimable service to the various portions of the Empire which are rich in mineral products. In the matter of research more particularly the separate units will benefit, for they will be able to command the services of the highest trained experts and so be put in the way of turning to the fullest account resources which they possess.

INDIA'S PROFOUND INTEREST.

Needless to say India has a profound interest in this new development of Imperial activity. Recent events have shown how immensely valuable are her deposits of the very best description of iron ore and this is only one of her possessions. Mineralogically she is without doubt one of the most favoured regions of the world. Her special need at the moment is for an intelligent and enterprising utilisation of her known resources coupled with a systematised expert investigation of territory likely to promise discoveries of new fields of effort. This the Bureau, acting in conjunction with official effort in India, should provide. On the one hand its machinery properly worked will stimulate local effort and on the other it will open the way to the provision of the necessary financial support for ventures which though of the greatest promise would not in ordinary circumstances be able to secure capital for lack of the necessary knowledge of their potentialities. We have only to look at the history of tungsten to see what may be done by an alert central organization

intent on turning to account the Empire's material resources. Until the war as by a flash revealed the remarkable value of this product the average British subject knew nothing and cared less about the methods by which the rich deposits of wolfram on British territory were insidiously exploited by Germans. Knowing all we know now we are amazed at the indifference which prevailed in high places on this vital matter. It apparently was nobody's business to see that this remarkable mineral was protected from unfair exploitation: still less was it the duty of any official to encourage its development of British hands.

QUESTION OF STEEL PRODUCTION.

The question of steel production is one which is assuming daily increasing importance owing to the enormous and almost insatiable demands that are being made for the material by war departments. The position of late has been made notably worse by the necessity that has arisen for replacing lost tonnage in the most expeditious manner. Standard ships are being built with the utmost celerity and an immense quantity of steel plates is being absorbed for this purpose alone. Such is the stress that it has been found necessary to restrict exports of steel goods to a very material extent. Another result is that boiler construction has had to be limited though there is an insistent cry for new boilers from all quarters. The worst phase of the matter is that the stringency in the steel trade is likely to grow rather than to be reduced. Even if the submarine war were to end to-day the need for new shipping would be so great that yards would be fully occupied for years to come. In the circumstances the steel production of India is likely to be a factor of increasing importance in the world's markets. Indeed, it requires no great stretch of the imagination to foresee a time when she will be one of the greatest steel producing countries of the world. In

association with her steel industry if she follows the fashion of the Dominions she will have a ship-building interest designed on lines suited to her needs. Bombay and Calcutta may thus at no remote period become to India what Jarrow, Belfast and Glasgow are to Great Britain.

IMPORTANCE OF SCIENTIFIC KNOWLEDGE.

One of the results of the war has been an increased appreciation of the value of technical literature. Dr. Addison, the Minister for Reconstruction, in a recent speech made a special point of the desirability of a wider diffusion of specialised knowledge and suggested the formation in industrial centres of libraries which would be useful for research purposes. His view is that each town should create a library of works dealing with the subjects which touch the staple industry of the locality. In the war, he said, we had been hampered to a tragical degree by the absence of necessary scientific and industrial information of a serviceable kind. We had been deprived of certain necessary essential minerals and of the knowledge of how to work them. In our ignorance we had allowed ourselves to become dependent upon German and Austrian manufacturers and the results had been lamentable. While we had in the homeland and in our overseas possessions all the essential raw materials we had neglected them because the necessary scientific examination and testing of trade processes had not been undertaken. The Committee on Scientific and Industrial Research would do much to remedy this state of affairs, but, Dr. Addison urged, we could never make the fullest use of our resources unless the trades themselves and the localities in which they flourished took an active part in the work. This little homily on the importance of scientific knowledge is fully in harmony with the best educational thought of the day. On all sides in the higher academic circles there is a strenuous desire manifested to improve the scientific equipment of the

industrial workers in order to fit them for the new era of development which lies immediately ahead. Out of this intellectual ferment should come a system which will give to British industry the world wide over a more solid position and restore to it something of its old pre-eminence as a pioneer in economic enterprise.

A STRIKING PUBLIC PRONOUNCEMENT.

In regard to the question of scientific research another rather striking public pronouncement was made by Professor J. W. Pope at a meeting of teachers in London a few days ago. Professor Pope took as his special theme the chemical industry. He declared that Germany prepared for the war by the establishment of a huge chemical industry which was built up about the coal tar industry. The coal tar industry, he reminded his audience, was an original creation of Great Britain. Moreover, we formerly produced practically all the nitric and sulphuric acids and the greater part of the alkali used throughout the world. Our supremacy had been wrested from us as the result of Germany's foresight and exploitation of scientific ability. While Germany had encouraged scientific research we had made the specialist entirely subservient to the administrator who was usually chosen on the principle that the less he knew about the duty to which he was assigned the better it was. Eversince the war these utterly wrong principles of action, he asserted, had been put into operation in the system adopted by the Government for re-establishing the coal tar industry. An organization was established in which all the people in control were men who knew nothing whatever about chemistry or science and who consequently were giving an entirely wrong direction to the movement. Lack of education was, Professor Pope argued, the reason for this blundering. If, he said, it were generally demanded that no person should be regarded as decently educated who had not mastered

the rudimentary principles of natural science and scientific method, such farces as that recently staged in connection with the coal tar industry would be impossible. There is, no doubt, a spice of exaggeration in Professor Pope's criticisms of Government action but in the main he is right in his theory that official ignorance is the parent of much of our failure to take advantage of opportunities which our incomparable economic position should confer upon us. Incidentally in his address Professor Pope made some observations about the excessive diversion of talent into the channel of the Law which have an application to India. Hitherto, he said, the law had absorbed a great portion of the youths of the nation who were best fitted for a scientific career. This, he maintained, was entirely wrong. A youth should be taught that it was his duty not to use his abilities solely for the purpose of acquiring an easy and comfortable position. Above all he should be made to see the inadvisability of entering such a blind alley occupation as that of the law with the ultimate prospect of quitting the world having left nothing behind and having made no contribution whatever to its progress. Lawyers, I fancy, will be induced to join issue with Professor Pope on his estimate of the value of a legal career. But it is undesirable that both in Great Britain and in India there has been too great a disposition to exalt the law as a profession over the less showy and lucrative callings which are associated with Science.

FUTURE OF THE RUBBER INDUSTRY.

The future of the rubber industry is one of the fascinating problems of the future. Will plantation rubber—and to all intents and purposes this means British plantation rubber—maintain and even increase its hold on the world's markets, or will it have to yield to some new influence, such as synthetic rubber, which may assert itself in coming years? There are many stories afloat in reference to

the manner in which Germany has contrived to carry on with an artificial substitute for the large quantity of true rubber that she formerly imported. But in expert circles a generous scepticism exists as to the truth of the assertions which have been made relative to the success of her experiments. That artificial rubber has been produced is deemed to be highly probable, but that the product is satisfactory in all respects and that it can be manufactured at an economic price is very strongly doubted. What may prove a far more serious factor in the plantation rubber outlook than synthetic rubber is disease amongst the trees. Rubber planting on an extensive scale has not been sufficiently long practised to enable us to say that there is nothing seriously to be feared under this head, and recent reports from British Malayan estates suggest that the danger of some insidious foe to the trees appearing to devastate the plantations is not entirely chimerical. Nevertheless, the confidence of the public in the soundness of the industry shows no sign of diminution as the steady demand for rubber companies shares plainly attests. On the whole probably the investors are right. The chances are that the plantation rubber industry has a long career of prosperity before it, chequered possibly by temporary drawbacks but gravely menaced by no development whether in the shape of disease or a new competitor. Meanwhile, it is fairly certain that the restriction of the imports of wild rubber will continue. The cost of collecting the product in the Amazon Valley is already so high as to be almost prohibitive when the price falls below a certain point now often reached. The initial expenses are not likely to become less with the lapse of years as the distances to be traversed by the collectors tend to increase with the exhaustion of the nearer forests. If the general expectation of a great rise in the price of rubber immediately the war ends is realised the natural Para product will hold its own for a time, but its ultimate doom would appear to be certain.

ARNOLD WRIGHT.

INDIAN FINANCE AND COMMERCE.

India's Economic Problems.

Calcutta, 12th January, 1918.—Not the least difficult function of the commercial chronicler is to get the events he chronicles into correct perspective. Recent weeks have been rich in occurrences and developments inviting comment; but to deal with all of them faithfully would require more columns than the *Journal* can spare. Of commercial literature, and other expositions of India's economic status and ambitions, there has, during the christmas period, been no lack, and there could be no stronger proof of the great prominence economic problems are attaining. There are, it may be observed, not many media of economic information affecting India, more ample, frequent, or accessible than the publications compiled so ably, and issued so cheaply, by the Director of Statistics; and amongst his more noteworthy issues last month must undoubtedly be placed his blue-book concerning Indian Banking. The Manager of the Bank of Mysore will perhaps review this important document in the *Mysore Economic Journal*; it undoubtedly deserves such an analysis for, it has not been as widely quoted or studied as it deserves. Another notable publication has been the official blue-book concerning tea publications compiled with such studious care are invaluable as bases of study, and, in issuing them, the Director of Statistics displays sound insight regarding one of the means, *viz.*, reliable and ample information, freely circulated,—whereby industrial progress is furthered. The banking blue-book especially, is calculated to stimulate discussion; it provides material for considerable criticism concerning the country's lack of banking facilities and it is the duty of public men, but

especially of men able to speak authoritatively upon economic matters, to rub the moral home. Banking is the weakest link in our economic chain; it is also, unfortunately, the link that commands, in proportion to its importance, the least attention. It has often attracted discussion, but without practical result. And if banking is one weak link, our insurance organization is undoubtedly another. Upon that subject let me recommend study of the yearly report of the Government of India's actuary. Mysore has its own official insurance experts and they will no doubt utilise Mr. Meikle's report to buttress the case recently expounded in the *Journal* for systems of insurance specially adopted to local conditions.

AN INTELLECTUAL RENAISSANCE.

At Poona, there has been the Agricultural Conference, but comment thereon from Calcutta would be tendering coals to Newcastle. In "Congress Week" the Industrial Conference assembled and adopted resolutions which attest the craving for economic progress even though they possess otherwise, little value. In the sphere of exposition as important an utterance as any in recent years was the Viceroy's speech at Madras where, speaking at the Industrial Exhibition, he declared that "the old *laissez faire* policy with regard to industries is dead and buried" and announced that Government only await the termination of the war to press forward with a policy which Lord Chelmsford believes, "is fraught with untold possibilities of good for the people of this land." I will refrain from elaborate comment upon this important declaration. The Government of India could hardly be refused freedom to assist industrial development when Governments elsewhere are supporting economic expansion with every resource of the State; and that such freedom has been attained and publicly notified, marks as important and irretraceable an advance towards industrial autonomy as the modification of

the cotton excise policy,—announced last March,—embodied towards commercial autonomy. I have not, I may say, observed that publicists have extended adequate recognition of the importance of the Viceroy's announcement; but, in times less given over to political excitement, it would have figured as an utterance of the highest national importance. It has been Lord Chelmsford's lot to put through reforms at least as consequential as any credited to any of his predecessors; indeed, politically, financially, and economically the last two years have, in my humble opinion, yielded more important changes than any in the preceding fifty years. Look in what direction you may, nothing is as it was; nothing will be, as it has been. That political changes of vital character are imminent is admitted. That economic and financial reforms are occurring equally as vital is grasped only partially. But the fact remains that in the Government loan system; the country's banking machinery; in the methods of financing railways; in the outlay on, and programme of, agricultural improvement; in technical education; in the methods of purchase of Government stores; and in the general attitude of Government towards industrial development,—in all these directions changes have either occurred, or are pending, whose cumulative effect will be to give this country's industrial status and outlook an entirely different complexion to that it has borne hitherto. Who, let me ask, would have forecasted, even two years ago, that Government in this country would now be encouraging ship-building? Again, what financier, three years back, would have predicted that the Government of India, in one year (1917) would borrow from local investors over seventy crores of rupees? The country's wealth, indeed, has increased proportionate to the creation of wider opportunities for its utilisation. It cannot even be said that industrial progress awaits the presentation, or carrying into effect, of the recommendations, due this

year, of the Holland Commission. Events have proved stronger than Government's intentions. War needs cannot wait, and research, experiment and expansion in the industrial field are proceeding rapidly. Nor progress confined to one phase of life, or to one section of the industrial field. It is on the contrary universal. In the scientific field there is,—an event full of significance to scientific development—the establishment in Calcutta of the remarkable institution associated with Sir J. C. Bose. There is the Indian Science Congress, again in session. There is the Chemists' Conference convened by Sir Thomas Holland. These conferences spell fuller research, co-ordination, and development. Progress therefore is visible not merely in one part of national life, but in all. Whether the mind turns to politics, industry, finance, science, or agriculture,—the impression persists—changes are proceeding, new minds are dominant, and, with them, new ideas. There is an entirely new spirit abroad, a tendency to challenge, almost in the same breath, long-established institutions and long-established principles. The ferment indeed is so great, so general, and so deep-reaching as to warrant the statement that what we are now witnessing in this country is an intellectual *renaissance* forming the birth-time of movements, leaving unaffected no phase of the nation's life, and whereof no man can see, or forecast, the end.

Our next Finance Member has declared in advance for lavish outlay on agricultural improvement and this to our stagnant rural areas is almost as important an announcement as the declaration of the Viceroy that hereafter the full power of the State will be at the disposal of the great business of industrial development. The officials of Government, there are indications to prove, will take their full part in laying the foundations of the new India now in the making; and indeed, impression, especially of some of the younger officials, is that they have the ambition, and command the ability and

power, to enforce changes in more directions than one. The younger officials I have in view are especially keen on economic progress; one is bent on the establishment of elaborate banking facilities; another has worked out plans, and referred them for decision, concerning adulteration of produce; another again, is challenging the adequacy of the present machinery for extending co-operative credit; and these are but three examples among many. The tests of administrative success, in fact, are changing. The ambition of the pushful Civilian stretches now beyond maintaining peace and dispensing justice to extending prosperity and assisting in unravelling and aiding the forces of economic and political evolution. The *beau ideal* of the new Civilian ideal is Sir Harcourt Butler who so stimulated economic progress during his short tenure of office as Lieutenant-Governor of Burma. The administrator now-a-days who does not wear an industrial buttonhole is not in fashion. Sir Harcourt Butler's buttonhole was wolfram; Sir Edward Gait is looking after mica; the Governor of Bombay is happy at cattle-breeding; while Lord Pentland, when free from political cares, promoted industrial exhibitions. I might go on, but enough for the day is the evil thereof. The current industrial watchword is, full steam ahead—there are obstacles but nothing now can prevent this country undergoing great industrial expansion.

DUX.

During the past fiscal year there were constructed on the national forests of the United States 227 miles of new roads, 1,975 miles of trails, 2,124 miles of telephone line, 89 miles of fire lines, 81 lookout structures, 40 bridges, 222 miles of fence, 455 dwellings, barns, and other structures, 17 corrals, and 202 water improvements.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Cement Industry

Washington, D.C., U.S.A., 11th October, 1917.—Complete statistics of the United States Portland cement industry in 1916, which have just recently been finished by experts of the U. S. Geological Survey, show that the shipments for that year—94,552,296 barrels, valued at \$ 100,014,882—holds the record, and that the production of 91,521,198 barrels is second only to that record year of 1913, when 92,097,131 barrels were manufactured.

The Illinois and Indiana district was the only one that showed a decrease in shipments, its shipments in 1916 having been 2 per cent less than in 1915. The largest increase in both shipments and production was reported for the Rocky Mountain States, the shipments being 28 per cent and production 25 per cent larger than in 1915.

Higher prices for cement prevailed throughout the United States in 1916, except at a few places where top prices were realized in 1915. The average factory price, per barrel in bulk at mills, was \$ 1.058, compared with .86 in 1915, an increase of 20 cents, or 23 per cent.

The combined production of natural and puzzolan cements in 1916 was 842,137 barrels, valued at \$ 430,874, compared with 793,541 barrels, valued at \$ 398,428, in 1915.

TRADE ACCEPTANCE DEVELOPMENTS.

The U.S. Federal Reserve Board has been making a general inquiry into the use of trade acceptances by business houses throughout the country. The results now available show that the introduction of the trade acceptance is proceeding slowly but surely. Under existing commercial practice most trades have become habituated to the use of the so-called cash discount system. In

accordance with that system, buyers very generally draw upon a previously accumulated bank balance or else furnish themselves with the necessary funds by giving their local bankers their own notes, either with or without collateral. Immediate payment made by the use of such funds is rewarded by the allowance of a substantial discount for this "cash" remittance. The "cash" has, however, as just noted, been provided in many instances by local borrowing.

With few exceptions, officials of the board have found, the business houses of the country show themselves inclined to maintain this system, sometimes adopting in conjunction with it the plan of requiring acceptances from those buyers who are not able to, or for some reason do not choose to, take advantage of the cash discount, liquidating their indebtedness at maturity without discount. Trade acceptances are thus, in many cases, assuming a position as representatives of obligations incurred by concerns which find it easier or preferable to be carried during the necessary credit period by their mercantile creditors rather than by banks. The problem of improving the commercial paper of the country cannot be solved in this way, officials of the board declare, but requires the adoption of methods which will result in the substitution of discountable two-name paper for the main body of the "straight notes" which now represent the bulk of the commercial obligations of the nation.

WORLD'S MOST POWERFUL RADIO STATION.

The opening of the United States navy's high power radio station at Pearl Harbor, Hawaiian Islands, has just been announced. This is the most powerful radio station in the world, and is designed for direct communication with Washington and the Philippines. Exchange of messages was carried out this week between Sayville, Long Island on the Atlantic coast, and the Honolulu station, a distance of over 5,000 miles,

which is the world's record for long-distance exchange of communication by radio. The tests indicate that communication between Washington and the Philippine Islands will easily be accomplished with but the one relay through the Hawaiian station.

The Hawaiian station called Sayville at 2-30 o'clock in the morning, and transmitted a report from the commandant of Pearl Harbor Station, as follows:—

To the Secretary of the Navy, Washington.

"I have the honor to send you the first through message to Washington, D. C., from Pearl Harbor, Hawaiian Islands, radio station, and report satisfactory progress in test of plant."

The Secretary of the Navy replied as follows:—

"To Pearl Harbor:

"Express my gratification to the authorities of Hawaii on this momentous occasion wherein the first exchange of radio messages is made possible between Honolulu and the American coast of the United States; also my congratulations on the successful completion of the most powerful radio station in the world.

JOSEPHUS DANIELS."

The Secretary's message was acknowledged at 3-03, exactly thirty-three minutes from the time the Hawaiian station began transmission to Sayville station.

The Hawaiian is one of a chain of high power radio stations under construction by the navy department. The principal stations completed to date are Arlington, Darien (Canal zone) and San Diego. The other stations at Cavite, Philippine Islands, and Guam and Tutuila will be completed before January 1, next. The high power stations have three masts to support the aerial, each mast being steel and self-supporting. The apparatus is of the Poulsen arc type. Comfortable quarters are provided for the personnel of each of the stations.

TESTING THE VOICE WITH A TIN CAN.

A California musical professor and instructor has made an interesting invention for the purpose of analyzing tones, particularly those of the human voice. Just as by other devices it is possible to hear the heart beat, test the blood pressure, know the condition of the lungs, and so forth, in respect to the functioning of the body, this recently-perfected device has made it possible to determine scientifically the tonal qualities of the singing voice.

The three properties of tone, authorities tell us, are pitch, intensity and quality, and these are dependent upon three factors of the vibration of the sounding body—frequency, amplitude and form of vibration, respectively—which, in turn, produce the differences of length, amplitude and form of the wave motion propagated. Referring particularly to the last-named property of tone, it may be stated on the authority of both Ohm and Helmholtz that the difference in quality between two tones depends upon the presence and relative intensity of the various over-tones present in the complex tone. Therefore, every tone is comprised of its fundamentals plus a variety of over-tones, and it is the presence or lack of these over-tones that determines the musical or non-musical quality of a given tone. Hence, over-tones constitute the essential of the singing voice; and, brightly, it is the object of the invention referred to above to show just which over-tones are present and which are missing.

The device is constructed principally of tin, and from the main body of it are horizontally extended tubes of various sizes and lengths. There are sixteen of these tubes, and each is tuned to a different over-tone of middle "C". For the test the singer sings the five vowels on middle "C" into the protruding end of a tube, and the sound waves of the tone thus sung into the receiver enter a resonating chamber, which resonators record the presence or absence of the desired

over-tone by way of the vibrations of a tiny pendulum on a circular membrane. The test is repeated into each of the sixteen tubes and by so doing it is readily determined which over-tones need developing and which minimizing, in that particular voice, and on which vowel sound the most work is required.

This interesting device analyzes any tone into all of its structural partials or over-tones; but, naturally, it can do no more than indicate wherein the possible defects of the singing voice lie. The work of perfecting or developing the voice, with this knowledge of its qualities, must be accomplished through and by the vocal teacher and student.

ASBESTOS-CEMENT FOR CORRUGATED IRON.

In the effort to practise economy in the use of steel and iron of all kinds there has been developed and is now being manufactured a satisfactory substitute material for corrugated iron and sheets. It is an asbestos-cement roofing material. Several large plants have been erected and equipped for manufacturing this material. It is made as follows:—

After being finely ground and freed from extraneous matter the asbestos, which acts as a reinforcing agent, is mixed with Portland cement in the proportion of about one to six, and made into a kind of paste with water. This paste is then taken to a machine of the paper-making type where, on a large revolving drum, it is formed into sheets or felts. After being trimmed to size these sheets, if they are to be made into corrugated roofing, next have the corrugations impressed on them, the important conditions of this operation being to insure that the tops of the corrugations are as strong as the other parts of the sheets. Finally the sheets are subjected to a seasoning process. The corrugations are made to the three inch pitch which is usual with corrugated iron sheeting, not to the $2\frac{1}{2}$ inch foreign pitch, and they

can therefore be readily used to repair roofs composed of corrugated iron sheets.

One of the chief advantages claimed is durability and resistance to climatic conditions, especially to an acid laden atmosphere, which, as is well known, rapidly destroys corrugated iron. The sheets are also fire-proof and poor conductors of heat. The factories established are well situated as regards supply of water, of which large quantities are required. The machinery for the making of the material is conducted entirely of electricity. It is predicted that the new material will, at no distant time, entirely displace corrugated metal as a roofing material.

PORTABLE MOTION-PICTURE PROJECTOR.

Almost from the dawn of motion-pictures down to the present day efforts have constantly been made to perfect a projection machine so small, compact and light that it could be taken anywhere and operated by an amateur. One after another so-called "home projectors" have been devised and offered for sale, but each has usually lacked some important requisite when actually put to use and the problem has been tackled anew.

The latest device which aspires to the title of the perfect portable motion-picture projector which any one can operate appears to have come nearer the requirements than any others. The new projector is light, weighing but twenty pounds, and is also very compact and folds up to a size not larger than a small suit-case. It uses an ordinary electric light socket as its means of securing current—the light being produced by a specially made nitrogen bulb which casts a light as brilliant as that secured from the ordinary professional projector. The film can be started or stopped at any point and held stationary on the screen without danger of fire. The film can be turned backward at any time, if so desired, and there are numerous other features which will appeal to those seeking portable projection machines for the showing of industrial or commercial films.

One of the oldest film manufacturing concerns is the originator of the new projector. Having been so long connected with the film industry it was not difficult for this concern to avoid the mistakes made by previous experimenters with portable projection machines. A case in point is the brilliancy of the light, which has been a surprise to many projection experts. A picture equally sharp and clear is thrown on a screen eight feet wide or on a piece of cardboard only eight inches wide, as best suits the requirements of the user. Standard size films are used, and rolls or spools holding a thousand feet can be easily handled side by side. This feature enables the firm already possessing several reels of commercial film to show the subject whenever and wherever it desires. If a lecture is to be delivered with the film as it runs through the machine the new projector can be stopped at any point on the film in order to project a single view as with the ordinary stereopticon. In transporting the projector the lens, crank and legs are placed inside the case.

The application of motion-pictures to commercial life has been discussed many times; but the peculiar circumstances attending the present European war and its aftermath again brings this subject to the front. Indefinite uses will probably be found for the new portable projector in selling goods abroad in post-bellum days. American salesmen who will invade Europe to sell goods of all sorts will not use samples or models of their goods, especially if they are selling machinery, building supplies and the like. Instead, they will display motion-pictures of the huge American factories actually at work turning out the goods, showing every detail of manufacture, and ending with a pictorial demonstration of the goods actually in use by the ultimate consumer. It means the elimination of small working models of locomotives, huge tractors, and ponderous machinery of every kind from the salesman's equipment.

ALFRED T. MARKS.

NOTES.

The great European war has brought out in the most striking manner, the helplessness of India owing to want of machinery. If the raw products which are so abundant have to be converted into manufactured goods, the country must be able to prepare its own machinery. Unless this grave difficulty is removed, no permanent improvement in industrial development on a large scale can ever be expected. The difficulties in the way are, indeed, very great, if not almost insurmountable. Large capital will be required; designs for machinery, metals and superior skill. There is the prospect of machinery being made available as soon as the war is over, when with the superior resources and skill of the West, it may not be possible for indian-made machinery to withstand the competition. However, in the long run, it will repay India to manufacture her own machinery such as would suit her large and small industries and the genius of her trained workmen. After all, much of the money will be spent in the country and valuable experience will be gained. This is the best time for serious and earnest endeavours being made in this direction.

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We are glad that the Industrial workshop at Bangalore is making progress and District Workshops are going to be established. We attach much importance to this aspect of industrial regeneration and we think it will be worth the while of the Conference to concentrate energy on this point and spend if necessary any reasonable amount for adequately equipping the Central and District Workshops so that they may be able to meet the urgent requirements of the State and of private enterprise. Other countries have made immense sacrifices and unless we are prepared to follow their example and do things on a large scale,

irrespective of considerations of cost in the beginning, satisfactory results cannot be achieved. It would be interesting if a list of all the articles which can be made locally were advertised in the *Economic Journal* from time to time. We are glad to note that the present Director of Industries and Commerce is devoting a great deal of his time and attention to the Workshop.

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A great deal of Mysore trade is slipping out of the hands of Mysoreans; even the profitable business of money lending, and the profits thereof are largely shared by outside capitalists. In export and import trade, in the purchase of grains, in marketing silk or cotton or arecanut outside capital is prominent. This is inevitable because the age in which we live is an age of keen competition and competition extends to all parts of the world; men with money and brains exploit all available fields, irrespective of territorial or administrative divisions. It is only organization and local capital that can stem the tide of outside competition. It must be remembered that the mercantile world outside Mysore, in Bombay, Madras or Central India has proportionately greater resources in money and men trained in business and when they divert their attention and capital to Mysore trade and commerce, they make profits easily and gradually they establish themselves on a firm basis. We are therefore glad that the Department of Commerce is taking up the subject seriously. If both the Government and the local capitalists are keenly alive to the situation and continue to rectify matters, success may be achieved after a decade or two of strenuous work. If not, the ground we have already lost will be immensely increased in the near future. Every branch of Railway line we construct and every facility we offer for opening up the country in the interior, will be fully taken advantage of by shrewd businessmen of the surrounding British Districts and to our great dismay we may find that the

industrial and commercial prosperity we aspired for has benefited outsiders more than our own people. This is an inevitable consequence and this phenomenon is not peculiar to Mysore. Other Native States and even several parts of British India furnish striking illustrations and even in Ceylon and Africa we can easily point out instances proving our contention. The old shibboleths against State control and State aid are all fast disappearing. We are living in an age in which everything we have and even our very lives can be commandeered for the public good. Commercial and trade prosperity are not to be had without patient labour and substantial sacrifice on the part of the people and the Government.

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In by-gone days some of the Indian States were lending large capital to indigenous Bankers for financing trade and getting back for the State their due share of profits. Even after the consolidation of British supremacy in India we have heard from reliable sources that the banking genius of the head of a Native State in Central India benefited itself and the local bankers by the funds of the State being freely placed at the disposal of indigenous traders. The bankers of old also financed the State in times of difficulty. Therefore there is nothing exotic or out of place in a State Department of Commerce organizing and helping local trade. This ought to have been done long ago. We trust that the Economic Conference will be fully alive to the large demands which the present age of ruthless competition is already making on the State and its subjects in regard to the export and import trade.

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Mysore might well emulate the enterprise of Russia in the cotton-seed oil industry. Despite the chaos, they have some forty mills. The industry is established for the most part in the Ferghana, Murgal, and Merv districts. The cotton-seed from the first-named district contains a high percentage of oil specially

suitable for refining. It is stated that in the Ferghana mills there are more than thirty 16-in. hydraulic presses, seven 12-in. presses, and several small ones. The total quantity of cotton-seed formerly treated was about 144,000 tons per annum, the working year being 250 days. The yield of oil was approximately 21,600 tons, in addition to 48,000 tons oil-cake. Just lately two new mills have been established, and the old mills have been enlarged. The output, therefore, is considerably increased, and the total quantity of cotton-seed dealt with is now about 192,000 tons. The export of cotton-seed from Turkestan in 1913 was about 20,320 tons. It is said that one pood (36 lb.) of cotton-seed of first quality will yield 6'56 lb. of unrefined cotton-seed oil, 14'4 lb. oil-cake, and 18 lb. husks, the remainder consisting of linters and other waste. What is the position in Mysore? Echo answers "what?".

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The fruit-growers of Baluchistan appear to appreciate the efforts of the Pusa experts to provide them with a means of marketing their goods. During the season 1916-17 the sale of improved fruit-boxes exceeded all the anticipations formed on the basis of the demand during the preceding year and it was difficult for the staff to place the boxes on the market fast enough. During the season 4,398 boxes and 366 punnets were sold, the proceeds amounting to Rs. 5,028. Had the stock been larger, boxes to the value of at least Rs. 7,500 could have been sold. In their report Mr. and Mrs. Howard state that the provision of a suitable means of transport has proved to be a great incentive to the cultivation of grapes in Baluchistan. By means of the new crates and the two-pound punnets suitably arranged in them the fruit can be forwarded to Calcutta or Madras without damage. Unfortunately the manufacture of the fruit boxes impeded by the shortage of suitable wood which has either to be procured from Norway or hauled across the Punjab from the Himalayas. The

concessions recently made by the railways in the matter of the free return of empty crates will provide a partial solution of the problem in which Calcutta is closely interested.

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A curious bit of international business has attracted the attention of one of the most caustic of Parisian newspapers whose comments run as follows:—We are short of needles. This is a fact. And this poverty continues to be the chief anxiety of all the hosiery manufacturers among us. The French Government has just authorised the transport across France of 6,200,000 German machine needles *en route* for Catalonia in Spain. The passing of this mass of needles through Switzerland was effected in the easiest possible way without costing the Catalans anything in the way of charges. And it seems that there are six millions more ready to travel by the same road from the same source. Now we repeat that we are short of needles; we can neither send nor receive such goods, for the railways refuse to carry them. What a pity we are not Spaniards! The official reason given us is that German needles are only allowed to traverse France so that the Spanish factories that are working for us may not have to close. But, if the French authorities would only give us a small part of the favour that it accords so freely to the foreigner, the French knitting factories might also remain open. But officials cannot remember everything.

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The tussar is a kind of wild silkworm reared among the leaves of certain species of oak trees (*Quercus Mongolica*, *Quercus sinensis* and *dentata*). The cocoons are of a light brown colour, and the yarn, which is strong without being too coarse, is largely used in weaving pongee. Tussar silk can also be used in other kinds of weaving by being mixed with ordinary silk. Tussar silk is chiefly produced in South Manchuria.

The regions around Kaiping and Haicheng constitute the most important centre for this industry, and travellers passing through these regions in Spring and Autumn will notice innumerable cocoons adhering to the branches of oak trees. The natives reel chiefly the spring cocoons, while the autumn cocoons are exported principally to Chefoo from Yingkou, Dairen and Antunghsien. According to the latest returns, the tussar cocoons, yarn and waste silk annually exported from these three ports amount altogether to 7,100,000 yen, which represents about 25,000 piculs of yarn and 400,000 piculs of cocoons. Besides these, the amount of cocoons exported from Takushan and other junk ports may be put down at 100,000 piculs a year. Altogether the output of tussar cocoons in Manchuria probably amounts to 500,000 piculs a year, worth at least 10,000,000 yen

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We take the following extract from the Report of the Director of Industries, United Provinces for 1916-17:—The position remains much the same as reported last year. Excise regulations cannot very well be altered until there is a pronounced industrial demand, and the demand cannot well be tested until the Excise regulations are amended so as to permit of the manufacture and supply of cheap industrial spirit. The difficulty is that a cheap and effective denaturant suitable to Indian conditions has yet to be discovered; the same trouble exists in other countries, as, for instance, Russia, where large money rewards have been offered for the discovery of a suitable denaturant. Certain restrictions with regard to the source of supply of duty-free rectified spirit and denatured spirit have been removed at the instance of this department during the year.

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The production of wool from rags reduced to first stuff has acquired considerable attention for some time past, especially in

Germany, where the colouring material is first of all destroyed by use of certain chemical products (known as hyraldite, dechlorine, hydro-sulphite, etc.), which, whilst removing the dye from the material, produces a background tint which can afterwards be worked with good dyes. Italy using the same processes, produces about 150,000 cwt. of this wool per annum. An Italian engineer, Sig. Targini, has discovered two chemical pastes, which he calls "Viscolorine," by the aid of which it is possible, he says, (1) to remove most of the dye from the rags without changing the material, leaving only a lighter tint that is insensible to the effects of light and fulling; (2) to separate stuffs dyed with solid dyes from those dyed with dyes which will not stand washing; and (3) to utilise the extracted dye for dyeing woollen yarns or materials in the same colour as the rags possessed prior to their preparation for making wool of this class.

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According to an estimate in the *Munchner Neueste Nachrichten*, to February, 1915, German requisitions in Belgium of raw material and industrial plant amounted to £80,000,000. To December, 1914, the Germans had obtained levies amounting to £8,000,000. Since then, the regular contribution shows a total of £58,000,000 to August last.

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The sowings report of the sugar-cane crop of 1917-18 shows that the area in the Madras Presidency is estimated at 108,410 acres, as compared with the estimate of 95,770 acres made at the corresponding date last year, an increase of 13 per cent. The increase occurs in all tracts and is due to the high price of jaggery at the planting season and to the generally favourable seasons.

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A method for dissolving the sericine and loosening the fibres of raw silk with the aid of proteolytic enzymes obtained from the bodies of cocooning insects at all stages of

their growth is announced. According to B. P. 106, 503, these enzymes are brought to a temperature of 40° C., and the silk is immersed for three-quarters to one hour. Silk-scouring agents may be added, if desired, to assist the process.

The latest information published by the International Institute of Agriculture, Rome, regarding the cotton crop of 1916 in foreign countries may be summarised as follows:—In the United States of America the area and yield of cotton are estimated at 35,979,000 acres and 15,402,000 bales (of 400 lbs. each) as against 31,399,000 acres and 13,345,000 bales in 1915, or an increase of about 15 per cent both in area and in yield. In Egypt the area under cotton is estimated at 1,718,000 acres as compared with 1,231,000 acres in the preceding year, or an increase of about 40 per cent.

Figures compiled by the Canadian Department of Labour show that Canada is faring better than most countries in the cost of living. Since the war began the price of food in the Dominion has increased 75 per cent, in Germany about 250 per cent, in Austria 300 per cent, in Norway, Denmark, and Sweden about 200 per cent, in the United States about 90 per cent.

In a memorandum on the Utilisation of Straw, Dr. J. F. Tocher, Consulting Chemist to the Highland and Agricultural Society of Scotland, estimates that in view of the proposed Agricultural Programme of the Board of Agriculture for Scotland some 420,000 tons of straw may be produced in 1918 over and above the amount usually grown in that country. Dr. Tocher points out that straw can replace esparto grass satisfactorily in the manufacture of paper and that it could doubtless be employed on a large scale for making the straw boards used in ordinary bookbinding. He recommends, further, that after supplying the needs of farmers, paper-

makers and straw board makers, any surplus straw should be used (1) for making a digestible fodder by the soda process and (2) as an agent to promote the growth of nitrogen-fixing organisms in the soil.

The Perfumery and Essential Oil Record says.—The peninsula of Hindustan and the adjacent territories under British control possess soil and climate suitable for the growth of nearly all the tropical and sub-tropical plants which yield those sweet-smelling distillates so esteemed in the art of perfumery. That being so, it is little short of incredible that the Indian essential oil industry is, comparatively speaking, so small. Why is it that Indian attar of roses is almost a curiosity in this country, and that geranium, eucalyptus, and a score of other essences are not shipped from the great Eastern ports? True, Sandal-wood is an important product, but even here in pre-war times much of the wood went to Germany for distillation, and only recently has the Mysore oil been on the market in considerable amount. We are, therefore, pleased to see, that an experimental enquiry is being instituted into the prospects of producing certain essential oils in really important quantities. The investigations of Mr. Puran Singh, Chemical Adviser to the Forest Research Institute at Dhera Dun, have been published in "The Indian Forest Records", Vol. V, part iii. They deal with eucalyptus, geranium, and wintergreen, and seem to indicate that there is a promising field in each of these valuable oils.

The Colonial Trade Bureau intend issuing shortly a *Buyers' Guide and Export Directory of Indian Handicrafts and Manufactures*, and have, with this object, invited full particulars about each Indian Firm, Factory, Mill, Wholesale and Retail Commission Houses, Manufacturers' Agents, Stores, Banks, and all trades and professions, etc. All those interested in the industrial regeneration of India will do well to supply the requisite information under these heads. The Directory is to be printed at the Colonial Press, 14, Baker Street, Madras.

GLEANINGS.

In the House of Commons on August 11th Mr. Fisher (President of the Board of Education) introduced the Education Bill for England and Wales. He said the Government adhered to the administrative ground work of 1902, and it intended to give every child an unimpeded school life up to the age of 14 years. No child under 12 years of age could be employed for profit. The department would develop the higher forms of education, and improve the physical condition of the children. A novel provision was that every child, when no longer obliged to attend the elementary schools, would have to attend the continuance schools for 23 hours yearly, and receive full time education to 16 years of age, and part time education up to 18 years the latter to be taken from the employers' time, and to be given in the day-time. The life of the rising generation could only be protected against the injurious effects of industrial pressure by a further measure of State compulsion.

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The area under indigo in Madras is now estimated at 265,700 acres as compared with 335,300 acres at the corresponding date last year. The decrease is due partly to the failure of the rains at the sowing season in the Deccan but mainly to the fall in the local price of indigo dating from January, 1917. This fall did not affect the sowings in the southern district which take place normally in December-January. The season so far has been favourable in the Circars and the south but poor in the Deccan. At least a third of last year's crop remains unexported owing to the difficulties of freight so that the local demand for dye is poor. In these circumstances some of the crop may be used for green manure instead of for making dye. About 1,700 tons of dye can be manufactured from this year's crop but it is unlikely that more than 1,200 tons will be made.

The *Leather World* draws attention to a new use for spent wattle bark. It appears that the Imperial Institute authorities are highly satisfied with the result of tests, undertaken in the Imperial Institute laboratories, concerning the suitability of Natal wattle bark (after it has been discarded by the tanners) for the manufacture of paper. These tests, which were on a small scale, demonstrated that a good quality brown paper can be manufactured from the spent bark. This paper bleaches readily to a cream tint, and has been pronounced eminently suitable for newspaper purposes, and; with further treatment, may make serviceable writing paper. The Institute authorities have interested several large paper-mills in these discoveries, and large scale tests are now proceeding to confirm the experiments on a commercial basis.

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The British Food Production Department reports a continuing demand for fruit and vegetable bottling and drying demonstrations. Sixty-six of these interesting demonstrations were given in different parts of the country last week. The Departmental distribution of glass jars for fruit and vegetable preserving has now been completed, the total number of jars distributed being 1,626,972. The 2,500 tons of sugar entrusted to the Department for distribution to fruit growers desirous of jamming surplus fruit have been all disposed of. Up to Saturday last over 100 tons of blackberries, collected by school children from the country hedge-rows, had been delivered to the Government factories for use in making jam for the Army and Navy.

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Indian-made beer is having a wide sale just now, says the *Englishman*. The Punjab Excise authorities have reported that the sale of Indian-made beer increased last year from 886,000 gallons to 2,780,000. This is attributed to the presence of British troops and the scarcity of the imported article. The

sale of Indian-made beer in the bazaar and shops, however, fell from 137,000 to 120,000 gallons. Some districts continue to write about the popularity of beer with the Indian consumers but these figures do not support it. "It is yet too early to say as to its success in replacing stronger spirits," writes the Rawalpindi Deputy Commissioner. "People chiefly use it as a cooling, mild beverage mixed with ice in summer months."

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Some remarkable figures in connection with this pre-war trade are quoted in *Empire Trade Notes*. From 1911 to 1913 the normal export of Indian cow hides to Hamburg and Bremen was about three and a half millions per annum, but in the first six months of 1914 the figures to these two ports were over two and a half millions. In addition to this, Austria used to take normally nearly one and a half million cow hides through Trieste, and in the first six months of 1914 took over 1,178,000. In three and a half years before the war these enemy ports together took from India nearly nineteen and a half millions of cow hides.

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An interesting exhibition of Eastern carpets and rugs obtained from Persia, India, and elsewhere by enemy firms whose businesses in this country have been liquidated by the Board of Trade, was held recently at the Midland Hotel, Manchester, the fabrics being subsequently offered for sale. Among the rugs was one presented to Charles the Great by Mahomet II. and valued at £7,000. The exhibits also included a fourteenth-century Ispahan rug valued at £14,000, a prayer rug for the Mecca pilgrimage, and a royal Sineh rug with 700 stitches to the square inch and more than two hundred shades of colouring.

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Mr. H. R. Christie, formerly of the British Columbia Forest Service, has sent to an Ottawa friend a sample of the German Sand Bags made entirely of paper fibres.

In appearance the article somewhat resembles a coarse brown linen bag but is smoother in finish, each strand being tightly rolled and woven with great exactness. Mr. Christie states that the bags are very serviceable except when exposed to moisture, when they rot. The Germans, he reports, do not use nearly as many sand bags as the British and French, for the reason that they have more timber at their disposal and make prolific use of it.

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No less than 200,000 tons of wood pulp are said to be stored at Swedish ports awaiting sale or shipment. Much of the pulp held on storage has been brought and paid for by British dealers, but cannot be delivered owing to the Swedish embargo on shipments of wood pulp to that country. American buyers have abandoned their efforts to purchase wood pulp in Sweden. The Swedish Government now requires a guarantee that Swedish pulp exported shall be used in the country to which it is first shipped.

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Mr. J. W. Bell, of Messrs. J. W. Bell and Son, market gardeners and fruiterers, Burleyin-Wharfedale, is experimenting in jam-making by the use of beet as a sweetener. He has boiled beet to a pulp, and the proportions in the jam were 2 lbs. of beet, 2 lbs. of plums and 1 lb. of Sugar, instead of the 2½ lbs. of fruit and 2½ lbs. of sugar ordinarily used in making the same quantity of jam. He finds the jam tastes very slightly of the beet, but is quite pleasant and serviceable.

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It is reported from Christiania that a company is being formed locally to utilise papyrus in the manufacture of paper pulp. The name of the Company is the Walmer Papyrus Pulp Co., Ltd., with a capital of 1,50,000 Pounds. Papyrus growing in North Zululand will be utilised, and it is stated that a concession has been obtained permitting exploitation for a term of twenty years.

MYSORE ECONOMIC CONFERENCE.

THE AGRICULTURAL COMMITTEE.

A Quinquennial Review.

The Agricultural Committee of the Economic Conference was constituted to study the problems connected with agriculture, and work out measures for improving the economic condition of the raiyat by popularising better methods of work, by removing obstacles in the way of progress and by suggesting suitable subsidiary industries.

Full minutes of the Committee's deliberations have been published monthly and work reviewed year after year in the reports submitted to the Conference during the Birthday Sessions.

The following summary indicates the ground covered by the Committee's labours, and briefly enumerates the more important items of work during the last five years. The subjects dealt with may be broadly classified as under:—

- (1) Introduction of improved methods of agriculture.
- (2) Development of Sericulture.
- (3) Fruit growing on profitable lines.
- (4) Improvement of Live-stock.
- (5) Establishment of nurseries for fodder, and fuel.
- (6) Relief of Agricultural Indebtedness, and
- (7) Growth of Commercial crops.

IMPROVED METHODS OF AGRICULTURE.

At the instance of the Committee, the scheme for the formation of Large Landed Estates was sanctioned, and blocks of land not less than fifty acres in extent, are being granted by Government on the recommendation of the Deputy Commissioners of Districts, on condition of improved methods being introduced thereon.

Improved implements are getting to be popular in the mofussil and as the demonstration stage is well past, arrangements are in force by which these are supplied on a credit of three months by the Department of Agriculture to Taluk Progress Committees, and proposals are before the Committee about the application of *Takavi* loan rules to the purchase of implements, by which these transactions will become easy and obviate the necessity for a special collecting agency by the Department will be obviated.

Seed bins have been recommended to be supplied to the Agricultural Inspectors, so that good seed may be had handy for supply to private gentlemen applying for the same.

With a view to establish Manure Depôts; the aid of co-operation has been called in and an experienced Co-operative Inspector has been employed by the Committee to do propagandist work in this direction, and also in regard to sericulture. Three societies for manure supply have already been started in the Hassan District, and co-operative production will follow, in the wake of distribution and credit.

Experiments in well-boring were undertaken by the Director of Geology at the instance of the Committee, which resulted in the Committee recommending to Government to purchase a Keystone Driller and appoint a competent man to bore wells and proceed systematically with such operations in the State.

The need for the establishment of oil crushing plants in the Districts and a bonemeal factory at a central place have been urged, as well as the plantation of honge and other manurial trees.

DEVELOPMENT OF SERICULTURE.

Students were trained in the Tata Silk Farm in sericulture as stipendiaries under the Committee and trained men employed as Inspectors to raise and distribute disease free seed in localities where raiyats were already engaged in sericulture.

Farms for manufacture of seed have been established by the Committee at Channapatna, Kolar, and Mysore.

Mulberry cultivation has been stimulated and Government have recently sanctioned the grant of concessions for the encouragement of mulberry cultivation.

Government have, on the recommendation of the Committee, sanctioned rules for the grant of loans for sericulture.

As the training of students in different farms was prejudicial to uniformity of instruction and as a systematic course of theoretical and practical teaching was felt necessary in the interests of the students, a Central Sericultural Institute has been established at Mysore.

The executive work of the Sericultural Department was under the control of the Committee until June, 1916, and they were managing it with a staff of trained Inspectors, assisted for a year by the technical guidance of Signor Washington Mari.

HORTICULTURE.

The Committee evinced their interest in this industry by awarding scholarships to students desirous of undergoing a course in the subject, their main objective being,

- (1) To enable sons of ryots owning land to carry on the cultivation of fruits, flowers and vegetables on profitable lines.

- (2) To strengthen the hands of large land-owners in the State interested in the commercial cultivation of fruit and vegetables, and
- (3) To help a few literate students to earn a decent livelihood by taking up the private supervision of gardens.

A fruit survey was conducted under the guidance of Mr. Krumbiegel.

The scope for the extension of cocoanut cultivation was investigated and Government have, on the recommendation of the Committee, passed rules enlarging the concessions already available under the *Takavi* loan rules for land improvement.

Grant of lands on shraya tenure was recommended in favour of persons desirous of starting tea and camphor cultivation.

A good deal of propagandist and some practical work has since been done for the production of fruit culture. Rules for the encouragement of small or subsidiary gardens and for the grant of loans for planting large estates have been sanctioned by Government.

The formation of nurseries at District Head-quarters for the growth of indigenous fruit plants is awaiting sanction of Government. The supply of fruit plants at concession rates to persons in the mofussil from the private nursery of Messrs. Rudrappa and Son of Bangalore who have been granted a loan of Rs. 3,000 to organize the same, the provision of financial assistance, expert advice and guidance are the prominent features of the scheme now in operation. The Committee have under them a trained and experienced Horticultural Inspector and have employed in the Districts, Sub-Inspectors who advise people, select lands, order plants and supervise gardening operations under the control of the District Committees.

IMPROVEMENT OF LIVE-STOCK.

The deterioration of local breeds of cattle has been a problem for which solutions have been suggested time and again by the Committee, *e. g.*, attaching two breeding bulls to each Veterinary dispensary, one for improving the draught breed and the other for developing the milk strain.

Rules for the encouragement of dairying by the grant of loans have been sanctioned and ten applications have been dealt with under these by the Committee. The formation of Co-operative Societies for the purchase of milch cattle and managing dairy farms will receive due attention from the Committee's Co-operative Inspector.

Some modifications have been suggested in regard to the existing concessions for the provision of good sires, vesting Deputy Commissioners with

full discretion in the selection of breeding bulls and their distribution, and increasing the number supplied from eight to twenty.

A comprehensive set of rules framed by the Committee for stock-breeding, has been approved by Government, sanctioning, subject to certain conditions, the grant of fifty acres of land in each case, free of upset price, on shraya tenure, loans up to Rs. 5,000 at 5 per cent and provision of free veterinary advice.

With a view to combine milk and draught capacity in indigenous cattle and to attain real progress in both directions, the Committee consider that skilled direction in animal husbandry would be necessary for a certain number of years. An expert in general live-stock breeding could with advantage be employed for making a thorough survey of live-stock within the State, determining scope of improvement and establishing a cattle breeding and dairy farm, sheep and goat breeding farms, as well as horse and mule farms, and the Committee have strongly emphasised the need, there is, for engaging the services of such an expert.

The result of the experiments at the Kolar Sheep Farm conducted under the supervision of Mr. Bowring has been so far satisfactory and it is proposed to carry on the experiment at a farm to be located at Bangalore. The Merino rams ordered from Australia have arrived and thirty Dumba sheep are expected shortly from Quetta. With this number and select ewes from breeding centres, it is proposed to ascertain the scope for the improvement of the local breeds.

A Lister Hand Power Shearing Machine imported by the Committee has been found to be of some use in clipping.

NURSERIES FOR FODDER AND FUEL.

This question has been engaging the attention of the Committee since its inception and the idea of forming nurseries of fodder and fuel plants has taken definite shape this year. The scarcity of wood for fuel purposes is a growing complaint and facilities for fuel plantations have to be provided in the shape of seedlings. The Committee have recommended Government to sanction the starting of nurseries at District Head-quarters and they hope to concert measures in consultation with the Forest Department.

Some relaxation is proposed to be made in the Revenue Rules with a view to encourage the plantation of fodder, fuel and timber trees over larger areas and thus meet the daily increasing demand in this direction.

RELIEF OF AGRICULTURAL INDEBTEDNESS.

An enquiry has been going on in the districts, at the instance of the Committee, on the economic

condition of the raiyat, and information is being collected especially of the amount of debt he is burdened with, and the possible ways in which he might be relieved, e.g., by augmenting his income through occupations subsidiary to Agriculture and by lessening wasteful expenditure. The figures received so far are interesting in their own way and additional information is being called for with a view to make the enquiry lead to some definite practical action.

GROWTH OF COMMERCIAL CROPS.

Seeds and plants were freely distributed through the Economic Botanist and the Director of Agriculture so that land may be brought under tea, and camphor and the area under cotton extended.

The development of sugar-cane cultivation has been on the Committee's programme during the whole period and the Committee has been working up the subject in co-operation with the Department. The distribution of superior varieties of seed, the recommendation about establishing an experimental farm in the Kannambadi tract, the formation of special local committees in the Districts where sugar-cane cultivation will be taken up as a result of the introduction of irrigational facilities, are some of the main results of the deliberation of the Committee.

The encouragement of indigo and tobacco cultivation is under study and action will be taken shortly in the matter.

MISCELLANEOUS.

The passing of a Pest Act for the State and the settlement of criminal gangs also engaged the attention of the Committee, and definite proposals on the latter subject will be submitted in consultation with the Deputy Commissioners of Districts and the Inspector-General of Police.

Estimates of agricultural production have been compiled and standards of development in agriculture have been framed for the guidance of Revenue Officers.

Bulletins on local agricultural practices have been issued from time to time and interesting selections from technical journals have been circulated in print.

The Committee have been co-operating with the Department in developing Agricultural Education and the facilities therefor and as a result of their recommendation a Vernacular course in Agriculture at Hebbal has recently been sanctioned by Government.

EDUCATION COMMITTEE.

Report of Work Done.

The following is a brief Report of the work done during the half year ending 31st December, 1917:—

During this period, the attention of the Committee was divided between the formulation of *New Schemes* and the carrying on of the *Experimental work* entrusted to it. Under the former were discussed about twenty-three subjects, the most important of which are

- i. The Remodelling of the education of women with suggestions for increasing the number of girl pupils in schools.
- ii. A comprehensive scheme of Visual instruction.
- iii. A scheme for women's and children's libraries for Bangalore and Mysore.
- iv. A scheme for further development of the Mysore University.
- v. A scheme for instruction in loyalty, patriotism, self-discipline and *Espirit-de-corps*, in Schools.
- vi. A scheme for training young men in Fine Arts.
- vii. A scheme for establishing a Music School in Mysore.
- viii. A scheme for practical instruction in Horticulture.
- ix. The constitution of the Education Committee and the conduct of business in it
- x. Elementary Science Education.

The draft schemes as well as copies of the several Notes drawn up by the members have been submitted to Government except those bearing on the Constitution of the Committee and further development of the Mysore University.

Under Experimental work come.

- i. Popular Science Lectures,
- ii. The Backward Classes Scholarships,
- iii. The Home Industries Institutes of Bangalore and Mysore,
- iv. The Home Industries Classes,
- v. Portable, City and Rural Libraries, and
- vi. Educational Survey.

Four popular Kannada lectures on Science were delivered in Bangalore and two in Mysore, by the members of the Kannada Popular Science Association. Kannada Pamphlets on science subjects are being printed. Besides drafting the necessary

rules for the award of the scholarships to the Backward Classes, the Committee arranged for the disbursement of the scholarships in the District and Taluq Head-quarters. Intimation has been received that the 2nd and the 3rd grade scholarships have been disbursed throughout the State, and that the 4th and the 5th grade scholarship amounts were paid in forty-three Taluks. A Home Industries Institute was opened in Mysore and a Committee was appointed for managing it. Mr. K. R. Srinivasa Iyengar having had to resign his office owing to great pressure of other Government work, Dr. P. S. Atchyuta Rao was appointed in his stead Chairman of the Bangalore Home Industries Institute. A new Committee and a new Superintendent were also appointed. fourteen new Home Industries Classes were started during the year ending 31st December, 1917, the total number being seventy. Their accounts were audited by a special Auditor, syllabuses and revised rules were drawn up and brought into force. Rules and directions for Portable and Rural Libraries were published. Lists of books were printed, and samples were exhibited to the public during the last Dasara. The appointment of a Library organizer was recommended to Government. The right of returning five members to the Managing Committee was granted to the subscribers to the Bangalore and Mysore Public Libraries which were also recommended to be made permanent institutions. The Card Index system was introduced into the former and the staff was increased. Statements of Progress in the Libraries are appended. A model Educational survey of the Tumkur Hobli was made by Mr. C. Krishna Rau and the results are being scrutinized.

Spreading Information:—(a) Four Bulletins in Kannada and two Bulletins in English were issued, *i.e.*, (1) Mysore Collecting Savings Bank, (2) Rural Industry, (3) Oodyogika-margadarsini, (4) What is Modern Commercial Knowledge? (5) Extracts No. 1, and (6) Extracts No. 2. The pamphlet containing information on Education in Copenhagen was widely read.

(b) Two popular pamphlets on "Malaria" and "Tuberculosis" by Dr. M. Srinivasa Rao, were published.

(c) A Hand-book of "Careers for Young Men in Mysore" was prepared.

(d) The Standard Development Forms were filled in and revised.

Work during the Dasara.—During the last Dasara Session at Mysore arrangements were made not only for spreading information on various subjects but also for demonstrating the advantages of certain educational facilities provided by Government. Nine

Kannada and English Lectures on important subjects were delivered. The Kannada lectures were attended largely by ladies. Four Dialogues in Kannada, explaining the uses and advantages of Rural Libraries, Home Industries Savings Bank and Life Insurance were also enacted. A Championship competition in Typewriting and Shorthand for the Mysore State was held and prizes awarded.

Sub-Committees:—The eight Sub-Committees, *i.e.*, (Scholarships for backward classes, (2) Cottage and Home Industries Classes and Institute, (3) City and Rural Libraries, (4) District, Taluk and Travelling Libraries, (5) Science Lectures and Text-books, (6) Vocational Guidance Board, (7) Sub-Committee to deal with miscellaneous subjects, (8) Boys Scout Movement), held fourteen meetings, the Scholarship Sub-Committee having met most often. The work done by them have been from time to time placed before the Standing Committee. The Sub-Committee for District, Taluk and Travelling Libraries could not meet.

Other Items of Work:—

The number of subjects discussed	... 138
The number of recommendations made to Government	... 31
The number of recommendations sanctioned by Government	... 19
Number of Notes drawn up by members.	28

For work done by individual members, vide statement attached.

V. SUBRAHMANYA IYER,

BANGALORE,)
21st Jan. 1918. }

Secretary.

Statement of Home Industries Classes.

No.	Centre	Name of industry	No. of classes in each industry	No.	Centre	Name of industry	No. of classes in each industry
Bangalore City							
1	Sultanpet ...	Tape weaving ... Silk twisting ... Rattan ...	1 3 4	1	Bangalore Dist.	Nil	
2	Mahila Seva Samaj	Rattan ... Sewing ...	1 1	2	Mysore Dist.		
3	Shankarapuram ..	Knitting ... Sewing ...	1 1		Nagamangala ... Nanjangud ... do ... Talakad ... Sidlaghatta ...	Metal work ... Carpentry ... Rattan work ... Brass work ... Weaving ...	1 1 1 1 1
4	Kumbarpet ...	Tailoring ...	1	3	Tumkur Dist.		
5	Malleswaram ...	Knitting ... Sewing ...	1 1		Tumkur ...	Knitting and plain needle work	1
6	Sarada Samaja ..	Rattan ... Dress making ... Knitting ...	1 1 1	4	Chiknaikanhalli Sira ...	Knitting and sewing Knitting, socks, caps	1 1
7	Mission Road ...	Tailoring ...	1		Hassan Dist.		
8	Cubbonpet ...	Tailoring ... Toy making ...	1 1		Hassan ... do ... Arsikere ... Gramma ...	Embroidery ... Dress making ... Carpentry ... do ...	1 1 1 1
Mysore City.				5	Shimoga Dist.		
		Total ...	21		Shimoga ... Ayanur ...	Rattan work ... Tailoring ...	1 1
1	Chamaraja Mohalla ...	Tailoring and ... Dress making ... Bamboo work ... Decoration Painting ... Rattan work ... Tinsel and Woollen work ... Needle work ...	3 ... 1 2 3 1 1	6	Kadur Dist.		
2	Muslim Zenana Home Industries School	Cloth Printing ... Tape Weaving ... Tailoring ... Socks Knitting ...	1 1 1 1	7	Chikmagalur ...	Knitting; plain and fancy crochet work; lace and needle work	2
3	Old Post Office Road	Knitting ... Tinsel and Lace making ... Tailoring ... Rattan work ... Toy making ... Weaving ... Tinker's work ... Scents and Hair oil ...	2 1 3 1 1 1 1 1	8	Mudgere ...	Knitting, crochet work and sewing	1
		Total ...	26		Chitaldrug Dist.		
					Hosadurg ... Tallak ...	Metal work ... Knitting ...	1 1
					Kolar Dist.		
					Kolar ...	Embroidery, crochet, knitting, tinsel	4
					Total ...		23
					Grand Total ...		70

Progress of the Bangalore and the Mysore Public Libraries.

No.		Bangalore Public Library.		Mysore Public Library.
		1st July 17.	31st Dec. 17.	31st Dec. 1917.
1	No. of books in the Library	5,890	6,029	4,776
2	No. of Newspapers and Journals subscribed for	67	91	87
3	Total No. of subscribers	229	258	136
4	No. of visitors (during the half year preceding)	22,062	27,426	42,780
5	No. of books issued to Readers (during the half year preceding)	6,576	9,918	17,629
6	Special improvements made	Introduction of the Card Index system		

AGRICULTURAL COMMITTEE.

The following is a brief Report of work done during December, 1917:—

Fodder and Fuel.—The rules under the Land Revenue Code, regarding the grant of land on shraya tenure for the encouragement of fodder and fuel plantations, have been recommended to be modified in order to render them more attractive to persons desirous of planting timber, fodder and plants.

The Yemmedoddi Kaval.—The question of apportioning the tract of land suitable for fruit culture in the Yemmedoddi Kaval came up for consideration and it was decided that about 200 acres of land may be divided into blocks of five, ten and fifty acres to suit all grades of demand.

Horticultural School.—Four more scholarships have been provided for students belonging to communities engaged in practical agriculture or horticulture.

Consolidation of Holdings.—The economic importance of the consolidation of holdings was urged by the members and a detailed scheme will be drawn up for being worked out in at least one village of every model Taluk.

Improved Implements.—The increasing popularity of the improved implements supplied by the Department, has made it necessary to collect their value briskly and to reimburse the stock. Some difficulty was experienced in the collection of outstandings and to meet the situation, the Committee have proposed that there should be co-ordination between the Agricultural and Revenue Departments, that the collection work should be entrusted to the Revenue Departments, and that wherever possible, *Takavi* loans should be granted to persons going in for implements, the loans to be disbursed in imple-

ments to parties, the amounts being appropriated right away in adjustment of the cost.

To familiarise the ryot with the various parts of the improved implements and to enable him to attend to small repairs and replacements, Government have been requested to sanction the appointment of itinerant smith carpenters.

Dairy Farms.—A loan of Rs. 3,820 has been recommended in favour of Mr. Somanath Sastri of Goggihallimutt, Sorab Taluk, for starting a dairy on the Gopatha Farm at Hanswadi.

Agricultural Education.—To popularise the short courses, organized on the Government Agricultural Farms, it was considered desirable that arrangements should be made to feed the ryots who came to attend them.

Labour Supply.—With a view to safeguard the interests of *malnad* agriculture, Government have been requested to secure reciprocity with British India in matters of Breach of Contract.

N. RAMA RAO,
Secretary.

PROGRESS IN THE DISTRICTS.

Kadur.

AGRICULTURE.

Oil Cakes Manure.—The Mudgere Taluk Progress Committee obtained and distributed among the ryots in the Taluk two-hundred bags of oil cakes manure for sugar-cane cultivation.

Facilities for Cultivation.—The Committee resolved to take up for immediate consideration during the current official year the following subjects:—(1) The opening of seed depôts, manure depôts, and implement depôts, and (2) the rendering of financial aid to coffee planters in the District.

EDUCATION.

School Buildings.—The Kadur Taluk Progress Committee have collected Rs. 63-8-0 towards the

construction of a school building at Chiknallur and Rs. 103 for a school house at Asandi.

Grants to Libraries.—The District Committee resolved to request the Central Committee to grant Rs. 5,000 and 2,000 to the Coronation Free Library and the Chikmagalur Reading Room and Library respectively, to enhance their usefulness.

INDUSTRIES AND COMMERCE.

Grant of Scholarships.—The Committee resolved to forward five applications for scholarships for industrial and technical training sanctioned by Government, to the Industries and Commerce Committee.

GENERAL.

Settlement of Criminal Gangs.—The Committee thanked Mr. Abdul Wajid for preparing the memo suggesting measures for the settlement of criminal gangs in the District, and resolved to forward it to the Secretary, Agricultural Committee.

Shimoga.

EDUCATION.

Grants to Home Education Classes.—The Committee resolved to recommend to the Inspector-General of Education for the sanction of a monthly grant of seven rupees to each of the Home Education classes started at Sagar and Tirthahalli.

AGRICULTURE.

A Demonstration Fruit Garden.—The Shimoga Municipality and the District Board agreed to contribute annually Rs. 100 each towards the charges of the proposed fruit garden and the District Committee resolved to request the Shimoga Municipality to work out further details for the establishment of the proposed garden, all possible help being given by the Committee.

Development of Sugar-cane Cultivation.—The District Committee resolved to form a separate committee for the Shimoga District to concert measures for the development of sugar-cane cultivation under tanks.

INDUSTRIES AND COMMERCE.

Rice Mill.—In connection with the establishment of a 7 cwt. self-contained Rice Mill, the Committee resolved to request the Industries and Commerce Sub-Committee to investigate the possibility of floating a syndicate or company in Shimoga to raise a capital of Rs. 20,000 for the establishment of a mill.

Supply of a Still.—The District Committee resolved to recommend to the Director of Industries and Commerce in Mysore, to supply a small still to the Shimoga District costing within Rs. 500, and to place it at the disposal of the Superintendent of Industries, Shimoga, for experimental and demonstration purposes.

Training in Pencil Factory.—A. V. Kesava Murthy and Aaron Manoh were selected and recommended to undergo practical training in the Madras Pencil Factory for a period of six months on a scholarship of thirty rupees per mensem.

CONFERENCES AND MEETINGS.

Some Taluk Conferences.

Taluk Conferences were held at Bagepalli, Gudibanda, Chickballapur and Goribidanur in the early part of December, 1917. Small exhibitions were also arranged for. At most of these Conferences, the Deputy Commissioner presided. Lectures were delivered on Education, Agriculture, Industries, Sericulture and Horticulture. Mr. A. K. Yegnanarayana Iyer and some of the officers of the Hebbal Farm were also present and these demonstrated the use of improved ploughs and other implements, choice of seeds, etc. Mr. C. Venkata Rao, the Deputy Commissioner of the Kolar District, exhorted the people to work with greater zeal and co-operation and promised financial help in all deserving cases.

QUERIES.

Hints to Correspondents.

Write on one side of the paper only. (2) Write each query on a separate sheet of paper. This will facilitate answering questions as in many cases they may have to be referred to experts. Put your name and address down on every such sheet. No attention will be paid to unsigned queries. (3) Drawings for illustrations should be on separate sheets of paper. They must be made in black ink only on white paper—not in pencil or colour—and twice the size they are intended to appear, especially reference letters and figures. (4) Put titles to queries, and, when answering queries, put the number as well as the titles of the queries to which the replies refer. (5) No charge is made for inserting letters, queries, or replies. (6) Letters or queries asking for addresses of manufacturers or correspondents, or where tools or other articles can be purchased, or replies giving such information, cannot be inserted except as advertisements. No question is answered through the post. (7) Letters sent by correspondents, under cover to the Editor, are not forwarded and the names of correspondents are not given to inquirers. (8) As the space devoted to queries and replies is limited, they should be drawn up as briefly as possible. (9) To facilitate reference, correspondents, when referring to any letters previously inserted, should mention the number of the letter, as well as the page on which it appears. (10) All communications should be addressed to the Editor, *Mysore Economic Journal*, "Ringwood", Bangalore.

Query 1. Please let me know the addresses of purchasers of felled down plantain trees and oblige. I want addresses of purchasers of soap nuts also.

Banganapalli.

M. H. P. Ghatala.

Query 2. Pith is available in large quantities in these parts and it is, I hear, used for manufacturing hats, caps, turbans, toys, etc. I shall be highly thankful if you can kindly find a market in our Presidency for this article and introduce me to the wholesale importers in that commodity in Madras.

Powerpet.

K. N. Rao Naidu.

BOOKS IN BRIEF.

Elementary Principles of Economics.—

By R. T. Ely, Ph. D., LL.D. and G. R. Wicker, Ph. D.—*Revised and adapted for English Students by L. L. Price, M. A.*—Messrs. Macmillan & Co., London.

This is an ideal class book and hardly needs any words of praise from us for its general adoption as such in India. Political Economy is well taught when it is taken up in the spirit and on the lines on which Drs. Ely and Wicker have done their work. The subject should in a word, be made "teachable" and a book that can help us to do that to any extent is a welcome production. We notice that the authors have rightly restricted themselves to the enunciation of accepted principles of the science and have banned out theoretic discussion fit for the pages not of a text-book but of a journal. We are also glad that Public Finance receives attention at their hands. This is a part of Economics that is neglected no little by students and teachers, and the refreshing manner in which the subject is dealt with adds to its value. The questions at the end of each chapter and the appendices containing subjects for essays and discussions and presenting courses of reading are excellently conceived. They ought to stimulate thought and supplemental study. Mr. L. L. Price, who edits the book for English Students, has, we think, wisely refrained from unnecessarily varying the text of the authors, while substituting a fuller treatment of English development in the sketch of Economic History. In lieu of an account of industrial evolution in the United States and in adapting the chapter on Public Finance of the American authors to suit better the needs of English readers. To Indian students—who have so far learnt Economics on the British model—the book is certainly a welcome one. It is, however, doubtful whether any advance in the teaching of practical Economics is at all possible in India if books of this kind are not adapted specially for Indian students. This book is specially one which we would commend to the attention of competent Indian professors of Economics. An adaptation of this book to suit the special needs of Indian students would be a great step in building up a true science of Indian Economics.

Outlines of Sociology.—By F. W. Blackmar, Ph. D. and J. W. Gillin, Ph. D.—*The Macmillan Company, New York. 8sh. 6d.*

It is difficult to adequately praise a book of the kind that Drs. Blackmar and Gillin have between themselves contrived to write. It is so well conceived in its plan and so well executed that it is not easy to estimate the amount of labour it should have

involved. It is thoroughly exhaustive in its treatment moreover, and that is another point in its favour. For a text-book, which for the student or for the general reader, it is, we think, *the book* on sociology. The study of sociology is becoming more and more important at present and the need for a book written with care and within compass, has been great. Drs. Blackmar and Gillin have met the growing demand in a manner at once creditable to them and profitable to their readers. It would be impossible in a brief review such as this column is devoted to detail the divisions of the book or the many points of interest which they cover. Suffice it to say that it deals with every aspect of sociological study—including Evolution, Control, Ideals, Pathology, Methods of Investigation and History of Sociology—and that in a style at once striking and simple. We would strongly urge the claims of Sociology on the Universities of India. Hitherto the difficulty of securing suitable text-books was in the way of both students and teachers, and in the way of the Universities presenting it as a subject of study in connection with the Degree Examinations. Now there is no justification for its exclusion. The book we are now reviewing is primarily intended for such a purpose as the one indicated above, and we trust it will receive the attention it so richly deserves at the hands of the Universities. It is hardly necessary to add that the proper study of mankind is man and for that the class room as a preliminary is about the best.

Land and Labour in a Deccan Village.—

By Harold H. Mann, D.Sc., Principal, Poona Agricultural College, in collaboration with Messrs. D. L. Sahasrabuddhe, B.Sc., L. Ag., N. V. Kanitkar, B.Sc., B. Ag., Y. A. Tamhare, B.Sc., L. Ag., and others.—Humphrey Milford, Oxford University Press, London and Bombay.

Not long ago we remarked in these pages, in reviewing Mr. Jack's book on the economic history of a Bengal village that studies of this kind are of inestimable value to the student of rural Economics in this country. To this class of studies, must be added Dr. Mann's book *Land and Labour in a Deccan Village*. It is the natural result of Mr. Keatinge's stimulating book, *Rural Economy in the Bombay Deccan*. Dr. Mann's is a close, detailed study of a single village under the following heads:—Its physical character, including geology, soils, waters, and drainage; its lands, divisions and holdings,—under the sub-heads, village inams, land revenue from the village, holdings in the village and areas held or taken for cultivation; its vegetation, crops and cultivation; its agricultural stock; its people, and general conclusions. The last two chapters in the book are of exceptional interest. Some idea of the

economic condition of the villages surveyed may be had from the table given below :—

	Group I (Solvent from land alone)	Group II (solvent from land and labour)	Group III (Insolvent)
Number of families in group.	8	28	67
Number of population in group ...	25	137	452
Income :—			
	Rs.	Rs.	Rs.
(a) From Land ...	1,699	1,740	4,899
(b) From Labour, etc. ...	232	6,710	6,169
Total ...	1,931	8,450	11,068
Expenditure :—			
(a) Personal and Baluta	1,200	6,238	15,178
(b) Interest ...	54	652	1,809
Total ...	1,254	6,890	16,987
Excess + or deficiency (—).	+677	+1,560	—5,919
Excess or deficiency per family ...	+85	+56	—88
Excess or deficiency per head ...	+27	+11	—13

An examination of this table shows that the people (who are for the purposes of the inquiry divided into three well defined groups) in the most sound position are those with small families, with few children, with much land and with few debts. Only $8\frac{3}{4}$ per cent of the families are able to maintain themselves on their land alone, 27 per cent on land plus outside labour, and the remainder appear to be unable at present to reach the standard of maintenance which they themselves set up. As the economic position gets lower, the size of family increases. Whether it is the size of family that drags a household down to a lower economic plane, or whether it is poverty that has something to do with the larger family, is not, as Dr. Mann says, entirely clear in all cases. But it is evident that it is the absence of children and the very large proportion of money-getters in the families, that keeps very many of those in groups I and II in a fair economic position.

This economic inquiry into the condition of the people of a typical dry Deccan village is, as Dr. Mann himself remarks, disheartening. The debts are a crushing load on the people, but even were they removed more than half the families would still not be able to pay their way, counting personal expenditure at their own standard. And this is the case when outside employment was particularly active, and when no less than 30 per cent of the male population were employed at fairly good rates at Kirkee.

In the absence of such active employment it would be necessary for a part of the population to desert the village and seek employment, say, in Bombay, for part of the year at any rate, and in the end, almost inevitably to sever their connection with the land. We fail to see how this can be avoided even as it is, unless the land can be made to yield more than it does at present, or unless the local rate of wages increases. The latter change is going on, though hardly faster than the actual increase in the cost of living. The former, *i.e.*, the increase in yield from the land, has hardly begun.

What are the probable causes of this insolvent position of more than half the families in this village even according to their own standard of life? Dr. Mann indicates certain *probable* causes and these are partly social and partly agricultural. Under social, Dr. Mann sets down the endless sub-dividing of land that has been going on. He suggests consolidation of holdings as in Japan, but for this, as he justly remarks, an evaluation of how far public opinion is in favour of it is, in the first place, necessary. Under agricultural, he sets down the stationary condition of agriculture. There is, as he states, no evidence of progressive agriculture. Outside stimulus, he thinks, is necessary for this. The case of the increased activity of the Agricultural Department is fully made out. Among subsidiary causes, Dr. Mann thus writes:—"The lack of capital, except the land, and the high rate at which capital can be obtained; the relative uncertainty of dry cultivation even in this part of the Deccan and hence the apparent pity that such large quantities of water should pass unutilised by the village site; the poor agricultural stock which cause cultivation and agriculture generally to be conducted in an uneconomic manner; and the all but total lack of village organization to produce the greatest return from the land or to prevent economic waste,—all these are vital, but seem to be in large measure, included in the major social and agricultural causes already considered."

Dr. Mann and his collaborators deserve thanks for the excellent work they have done. They have done for Bombay what Mr. Jack and his assistants have done for Bengal. We should be glad if work like this is undertaken in other parts of India—in Madras, Mysore, United Provinces, etc. In Bihar, the Chankya Society has done useful work in this line but not in the exhaustive manner in which Dr. Mann and Mr. Jack have done. But they have been pioneers in the field and all honour to them. It is careful and close study of this kind that is likely to yield tangible results. Even after his exhaustive survey, Dr. Mann is not sure if the conditions prevailing in the village he has so carefully studied, "is typical of

the dry village of the Western Deccan." He believes it is, but cautiously adds that "further investigation is necessary before large and extensive schemes of dealing with the situation can be devised and brought into effect." This may be deemed excessive caution in some quarters, but we rather think it is not misplaced caution where large ameliorative measures are in question.

ACKNOWLEDGMENTS.

The Madras Exhibition of Indian Arts and Industries.—*Official Guide and Descriptive Catalogue.* Friday, 21st December, 1917, and following days, except Sunday the 23rd December, (Second Edition). Published by the Committee, People's Park, Madras.

Annual Report of the Indian Merchants' Chamber and Bureau for 1916-17.—Presented to the Annual General Meeting on the 26th September, 1917.

A House Building Scheme in the Indore City.—By S. S. Mehta, B.A., with a Preface by Rao Bahadur Sardar M. V. Kibe, M.A., M.R.A.S., M.C.

Speeches and Writings of Sir Dinshaw Edulgi Wacha.—First Edition. G. A. Natesan & Co., Madras.

A Survey of the Madras Dairy Trade.—By A. Curruth, Deputy Director of Agriculture—Live-stock. Vol. IV. Bulletin No. 73, Department of Agriculture, Madras.

Proceedings of the Mysore Representative Assembly, 1917.—Mysore Government Press, Bangalore.

Essential Statistics of the Mysore District for 1916-17.—By Mr. S. N. Sri Narasimha Sastri, District Economic Superintendent, Mysore. G. T. A. Press, Mysore.

The Cultivation of the Areca Palm in Mysore.—By Leslie C. Coleman, M.A., Ph. D., and M. K. Venkata Rao, M.A., F.L.S. Department of Agriculture, Mysore State.

Mysore Agricultural Calendar 1918.—Department of Agriculture, Mysore.

We have received besides the above some useful bulletins published by the Agricultural Committee of the Mysore Economic Conference.

RECENT PUBLICATIONS.

Pig-Keeping on Money-making Lines.—By W. Powell-Owen. $8\frac{1}{2} \times 5\frac{1}{2}$, 156 pp. Newnes. 2s. 6d. n.

Birth-rate and Empire.—By James Marchant. $9 \times 5\frac{3}{4}$, xi+226 pp. Williams and Norgate. 5 s. n.

The Development of Rates of Postage.—*An Historical and Analytical Study.* By A. D. Smith. With an introduction by the Right Hon' Herbert Samuel, M. P. $9 \times 5\frac{3}{4}$, xii. +431 pp. Allen and Unwin. 16 s. n.

The Rural Problem.—By Arthur W. Ashby, 40 pp.

Taxation and Social Reconstruction.—By Arnold N. Shimmin, 32 pp. **Women in Industry after the War.**—By B. L. Hitchins, 28 pp. (Social Reconstruction Pamphlets.) $8\frac{1}{2} \times 5\frac{1}{2}$, The Athenæum 6s. n. each.

Household Repairs and Odd Jobs in the House and Home. (Work Handbooks Series.) $7\frac{1}{2} \times 5$, 156 pp. Cassell. 1s. 3d. n.

The Determination of Farming Costs.—By C. S. Orwin, $8\frac{3}{4} \times 5\frac{3}{4}$, 144 pp. Oxford: Clarendon Press; London: Milford. 5 s. n.

An Adventure in Education.—By J. H. Simpson. $7\frac{1}{2} \times 5$, x. + 207 pp. Sidgwick and Jackson. 2s. 6d. n.

Towards the New Era.—A Draft Scheme of Industrial Reconstruction. By Samuel, E. Keeble. $7\frac{1}{4} \times 4\frac{3}{4}$, 39 pp. C. H. Kelly. 4d. n.

Some Economic Aspects of International Relations.—Papers by H. Sanderson Furniss, Edwin Cannan, and A. E. Zimmern. With Criticisms. (The Reorganization of Industry Series.) $8\frac{1}{2} \times 5\frac{1}{4}$, 89 pp. Ruskin College, Oxford. 7d. n.

The Wheat Problem.—Based on remarks made in the Presidential Address to the British Association at Bristol in 1898. Revised, with an answer to various critics, by Sir William Crookes, O. M. Third Edition, with preface and additional chapter bringing the statistical information up to date, and a chapter on Future Wheat Supplies by Sir R. Henry Rew. With an introduction by Lord Rhondda. $7\frac{3}{4} \times 5\frac{1}{4}$, xvi+100 pp. Longmans. 3s. 6d. n.

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THE WASTE OF MENTAL POWER.

BY RT. HON. SIR GEORGE REID, G.C.B.,
G.C.M.G., D.C.L. LL.D., K.C., M.P.,
*Formerly High Commissioner for
Australia.*

THE mental powers of life in its primary forms have been the subject of many admirable descriptions. I use the adjective to cover more than one compliment, but I chiefly refer to the simplicity and clearness which enable an ordinary reader to understand them.

The studies of the ways of small things like the wasp, the ant, and the bee, and of insect life generally, which have been published in recent years show many surprising results but most wonderful of all, perhaps are the industry, forethought, frugality, and discretion devoted by many insects to making provision for future needs, and in the prevention of waste.

The human mind is the form of mental power to which I propose to devote this brief notice. The mental powers bestowed upon mankind are pre-eminent even in their organic form, but their most striking attribute is the range of which they are capable. Some carelessly imagine that the minds of different men vary in the number of their original faculties; that the mind of Plato or

Shakespeare was radically different in design from the mind of the child or the yokel. This is sheer ignorance of a most mischievous sort. Just as one man has the same number of senses and bones and sinews as another, so one human mind has the same number of faculties as another. Differences of bodily strength, which are remarkable, and differences of mental power, which are far more wonderful, are to be accounted for, not as the result of different bodies, or different minds, viewed organically. Those differences, enormous though they be, do not arise because there were different original patterns of mind or of body. They spring entirely from more or less mysterious differences of power. If a beginner play a tune on the violin, and a Paganini then take the violin and play upon it, the difference will probably be as great as that between extreme discord and perfect harmony; but the violin is the same in both cases, and the fingers of both players are the same in number and kind.

The first great lesson in the prevention of mental waste is to impress upon mankind the initial fact that all minds are "free and equal" in the nature of their original design; and the second great lesson is that until you try your hardest, and do your best, you can never really tell what the limits of your mental powers of achievement are.

When we think of the teeming millions of children in schools of all kinds, the mental wealth they represent and the momentous contrasts between well trained and ill-taught minds, even in the early years of school life,

we are not at all rash, I think, in coming to the conclusion that there must be a great waste of mental power going on for which injudicious methods of selecting teachers, and preparing teachers, and teaching the children, may be largely responsible.

I do not wish to reflect unduly upon any authority. The duties of selection and preparation of teachers cover so many difficult psychological problems, and any sort of enlightenment on these problems, on a broad scale, is so comparatively new. Besides, though so much remains to be done, many great and admirable improvements have already been made. I do however look forward to a time when the definite subject of psychology—that is, the study of the nature of the human mind—will, even in our examinations for primary school teachers and our systems of primary education have a more prominent place. In the examinations prescribed by the Board of Education for England and Wales—which, upon the whole, show a great improvement upon those of a generation ago—I did not come across psychology as a subject for examination until I reached a “Special syllabus for children mentally defective.” I humbly submit that the study of the mental nature in one shape or another lies at the root of the education of every child, especially every child mentally efficient. Just as principles of ethics can be taught in shapes intelligible to the very young, so can the principles of the mental constitution. There is hardly a stage of education, beyond the infant classes, in which our future men and women are not capable of learning that the mind is the greatest wonder and the greatest power in the whole universe, and that there rank in the scale of existence, on the very throne of earthly living things, is not because they have bodies which can eat and drink, but because they have minds which can think, feel, and act.

If we wish to get the best minds—and we should strive to do that for the work of teaching—we must begin by paying the teacher

more, and by honouring him a great deal more than we do. The ancient Babylonians were, in one respect, far wiser in their day and generation than we modern people are, because they honoured culture as the highest form of distinction.

There is a far greater excuse in the case of the primary schools for the neglect of a study of the nature of the human mind than there is in the case of the highest of our teaching bodies, the Universities. Distinguished professors, splendid scholarships, and special prizes in a magnificent range of subjects, make our British Universities worthy of admiration in a very high degree. But if it cannot be done in any other way, I do think that Oxford and Cambridge could drop a professorship in Papyrology or Archæology in order to establish a Chair for the study of the Human Mind, which is the very soul of all that can be taught, learnt, discovered, or invented, and all the philosophies besides!

The most attractive, perhaps the most beautiful, of the mental states is that of an inquisitive child. Here at least is the chief enemy of a waste of mental power in full strength. Here at least is that insatiable spirit of inquiry—that love of knowledge—which, if we could keep them alive, would help, as nothing else could, to prevent the overwhelming waste of mental power which is the chief curse of modern civilisation. Alas! whether it is the system of teaching, or some “dry rot” in the mind of the child, in a few years the insatiable spirit of inquiry, and the love of knowledge, turn right away, as a rule, from the path of mental culture to those of enthusiasm for play. The school becomes a sort of prison, the teacher a task-master, in the minds of so many learners.

If that “dry rot” could only be stopped! If the mind could only be made as eager to learn as to play games! What a blessing it would be if the young minds could cry out, as readily as the body of a child can, when it has been crammed with indigestible things! After all, words are like walnuts; it is the

insides and not the outsides of them that are fit to eat!

It would be very unfair to place too much blame upon our systems of education, and upon our teachers. It is the people outside the schools who are most to blame. If their elders look upon work as a curse, and sensible to say nothing of instructive books as a bore, how can the juniors be expected to do anything else? The battle of life compels most people to work very hard, and the temptation to spend leisure idly or frivolously is naturally very strong. But men and women in the early prime of life should not too soon acquire that "tired feeling"—to which veterans are entitled although they are often the last to feel it. Surely some part of leisure time might be devoted to the higher objects of mental culture? It is really in those studies that the purer, stronger pleasures are to be found, and with them, new life and strength, for the drudgery of every day life.

I am one of the very last to decry physical culture, outdoor sports, and social recreation. All these are eminently wise in any scheme of life. Elasticity of mind and body is the first condition of health. But the more perfectly the immortal element in us is developed, the fitter we shall become for all emergencies and for all enjoyments too.

If the mind be viewed as a mere machine for earning wages, there is still a tremendous waste of mental power. It is the best wage earner and best investment any man can have, and he gets it for nothing. It is also the most wonderful sort of treasure you can possess, because the more you make use of it the more valuable it becomes. Yet we are all inclined to forget what it has done for us, and what it could accomplish if we would only make more use of it.

Another source of mental waste is the altogether absurd views which prevail concerning work, both in the classes above and the classes below. You can exhaust yourself shooting "big game," or falling over preci-

pices, or by doing nothing at all, and still be considered a gentleman of the first class. But if a man or woman of gentle birth engage in any really useful enterprise in the way of work at a business or for wages, the social fall is regarded by some as terrific. Perhaps, in point of fact, the going to work may be worthy of the greatest praise. More education of the right sort, and more culture will perhaps gradually lessen the tendency to look on industrial work as in itself a badge of social inferiority.

There is a world of common sense in the text, "Whatsoever thy hand findeth to do, do it with all thy might." Lack of concentration is one of the chief sources of mental waste. Reading, observing, working or reflecting with half your mind awake and the other half asleep frequently happens. But the road to excellence is not an easy one, and if you do not bring your mental power to bear in downright earnest upon everything you do, of any consequence at all, you miss one of the most valuable of all mental habits.

Another source of untold waste is the lack of ambition. Another, lack of courage. Failure is sometimes the surest road to success. The battles which may lead to the grandest victories are the wars against your lower self.

My long experience of life and human nature fills me with hope. The masses of mankind are only beginning to feel the force of their intellectual faculties. The unbroken ancestry of ignorance is being gradually exchanged for a new birthright, that of intelligence. The misfortunes, or the crimes, of centuries, cannot be redeemed at once! But the nations that fill the world's spaces are getting a better chance every day of that sunshine and social comfort which befits them as the masters of all things upon this earth, living or dead.

INITIATIVE : WHAT IS IT ?

BY MR. HOLBROOK JACKSON,

Editor of "To-day."

PEOPLE are often surprised by the sudden leap of some obscure person to a pinnacle of eminence. Without any apparent warning a name, hitherto unknown, blossoms like the rose in the pages of the daily papers; or in our own more personal and intimate spheres some one, in factory or shop or office, is as suddenly invested with the crimson of success. We are surprised, I say, and we ask questions. How do they manage it? Why should one be more fortunate than another? Why am I not successful?

If we could answer such questions in exact and scientific terms, we should have discovered the Philosopher's Stone, and henceforward everything we touched would be turned to gold. But we cannot answer them, for the simple reason that each person's success requires a different explanation. No two achievements of whatever kind contain the same ingredients. Success differs according to temperament and personality. One man is a good organizer—and may therefore succeed; another may be an indifferent organizer, but a good salesman or a good initiator, and he, likewise, may succeed. And the same variations may be seen in every direction.

Yet there is one very definite and, I think, very obvious principle underlying all kinds of successful deeds and actions. That principle is Initiative. It does not matter who you are or what you are, it does not matter what you do or how you do it, success will be yours in nine cases out of ten because you have exercised, consciously or unconsciously, the inward, mysterious, but indispensable power of Initiative. But what about honesty? you will ask. What about industry, integrity of purpose, and all the other virtues which our

parents and grandparents have handed down to us as models and guides? Well, these are still virtues; it is still necessary to be honest, it is still fine to be industrious, but without Initiative, honesty and industry may never know the joys of successful achievement.

We all know people of transparent honesty and tireless industry who have never succeeded at anything, and who never will succeed at anything unless the fickle spirit of Fortune blows them the kiss of luck. But give honesty and industry a chance of partnership with Initiative then your dependence upon fickle fortune is reduced to a minimum. Do you remember the story of the boy Stephenson? You ought to, because it illustrates very aptly this point of the relationship of industry and Initiative. Stephenson was engaged at a Tyne-side colliery to watch an engine, but he found that by initiating an arrangement with a piece of string, the machine would look after itself, and he have more time for play. This he did with results so momentous that they are known to all the world. From this you will see that the very opposite of industry may lead to success when Initiative takes its place. For if necessity is the mother, Initiative is certainly the father of invention.

Initiative comes before all the pocket virtues in the wisdom of life. It is the first rung in the steep and perilously placed ladder whose last rung is achievement. You cannot do anything worth doing without it; every successful man or woman is an initiator. You often hear the complaint that certain men draw large incomes and occupy high and responsible positions without ever appearing to do any hard work. This at first sight strikes the less highly favoured as unfair. But, where managerial eminence is rightly filled, it will be found that it is so because of its power of Initiative.

It is not only impossible for a manager to do all the responsible work of a great concern, it is undesirable. A manager is like the general of an army; his business is to initiate,

to decide upon lines of action and policy, and then to see that they are carried through. And it will be found after a careful examination of the lives of eminent and successful men, that the stepping stones to success have always been Initiative in association with other qualities. It is, says that H. G. Wells, in the initiative of the individual above the average that the reality of the future lies. And what is true of national progress is equally true of individuals.

The precise origin of Initiative may not be any clearer to us than are the intimate origins of so many other things, but we do know, or, rather, we ought to know what it is when we meet it. Initiative is the faculty of inauguration, promotion, introduction; it is the art of beginning. It comes quite easily to some, but it has to be developed by experience and laborious training in others. To begin anything may seem quite a simple matter until you actually try it, then you realise how much you are dependent upon the imps of Initiative.

Not only is this the case in the heroic walks of life—where a man has to face the tremendous possibilities of beginning a great picture, an opera, a Forth Bridge or a Battle of Waterloo. Indeed such initiations are probably easier than the lesser initiations of lesser folk. The promoters of these great things are as often as not so impelled by the unseen but imperative forces of genius or circumstances, that their acts become almost unconscious. But what about those (that is most of us) who are equally needy of Initiative but who lack the fire of genius and the kick of circumstance?

How many of us have stood hesitating on the threshold of beginning because we have not known how to begin! We have known for certain full many a time that could we begin success awaited us at the finish, yet we have not begun. We have crumpled up in the sight of Initiative, we have blundered, bungled and failed. Take the little momentous things of life, which apart from any

relationship with the necessity of earning a living, or making a fortune or a great name, dominate our peace and happiness. The difficulty of beginning a letter, the difficulty of opening a conversation with a stranger, the overwhelming difficulty of beginning your first speech in public, or of declaring your love in the presence of the girl whom you already know reciprocates that love and adores you to distraction. We have all been up against such difficulties, and such things are difficult because we are unskilled in the art of Initiative.

If such simple acts are difficult, how difficult must we find the acts of the higher Initiative. To, for instance, begin a letter or a speech or to make love, as no one has done such things before. Acts of that kind are the privileges of genius. But that need not discourage any of us. Genius lurks in strange places and not one of us is immune from its insinuations. I would even go a step further and say that no one, however incompetent or untalented, is entirely devoid of genius. Genius is not alone an affair of skill; anybody can become an adept in mere technical ability. Genius is oftener the result of blind and irresponsible abandon—of a sort of wild courage. A man will say what comes into his head and awake to find it wisdom. He will have initiated a thought, an idea, he will be a genius. Genius is the courage to initiate. And when things in this world are paid for at their true value, it is things which bear the stamp of that sort of genius which receive the highest rewards. They command the most logically earned of all rents—the rent of ability.

Initiation is the yeast of the bread of life. It is more than that, life itself is initiation. Nothing would continue beyond the moment unless it were being perpetually renewed. Every atom, every molecule, every cell and all the tissues which go towards the make-up of the formal and familiar things about us are being constantly purged and strained and stimulated into new activities and new forms

Every act of Initiative is an act of creation, and those who possess the power of initiation are the only creators. Initiative is required in all walks of life; it is the inspiring and progressive quality behind all action. You require it in business as well as in art, in sport as well as in manufacture.

Every work of art is the result of Initiative and men have never been afraid of applying the term, creation, to such things. But the impulse to create some form or symbol for the delight or instruction of mankind is also involved in other actions. To make two ears of wheat grow where only one grew before requires Initiative equally with the act of creating a Mona Liza, a Zeppelin airship or a Mauretania; and the Initiative which goes to the creation of such things differs not in kind but in quality from that which goes towards the successful conduct of anything be it a pie shop or a coal mine. It matters not whether you be artist or inventor, tinker, tailor, soldier, sailor, richman, beggarman or thief—Initiative will always be your prop and mainstay.

This is inevitable because life is dependent upon change. There is no standing still. You either go forward or go back. Getting on is going forward, approaching the goal you have set yourself, whatever that goal may be. When you think you are standing still you are being left behind, which is the same as going back. When a regiment marks time it does so for a special reason—not on principle. But marking time in life is losing time. You must go forward and to go forward demands constant use of the faculty of Initiative.

People who are thoroughly alive are constant spurs to the reactionary tendencies within themselves and within others. They are for ever seeking out new ideas, new excuses for action, new moves in the game of life. They are alert and tireless in pursuit of the object they have in view applying idea and notion, experimenting, scrapping failures, pushing obstacles out of the way, and looking

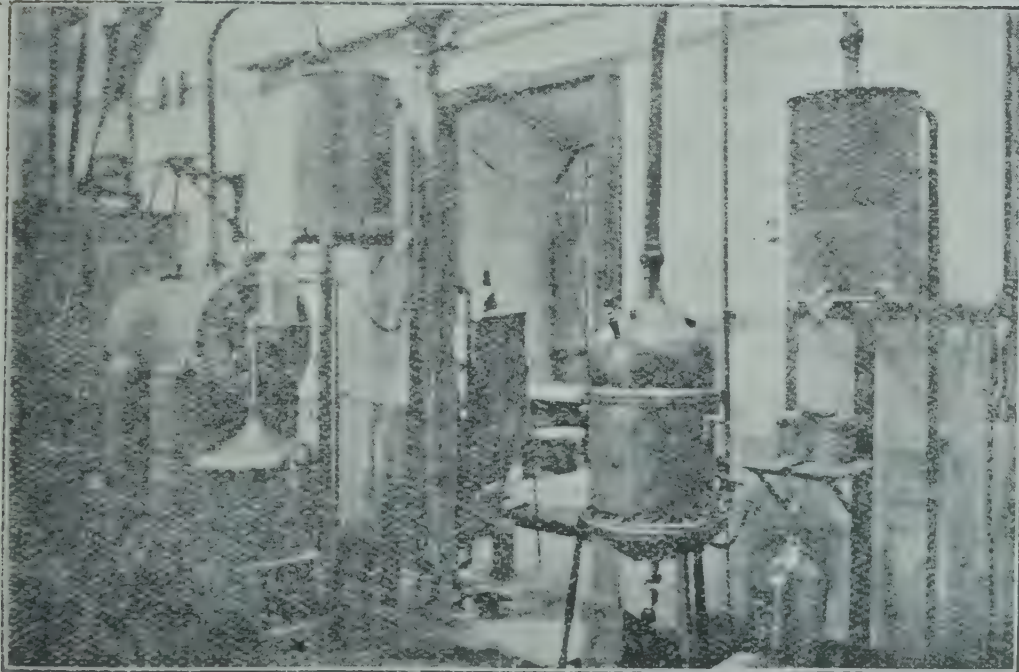
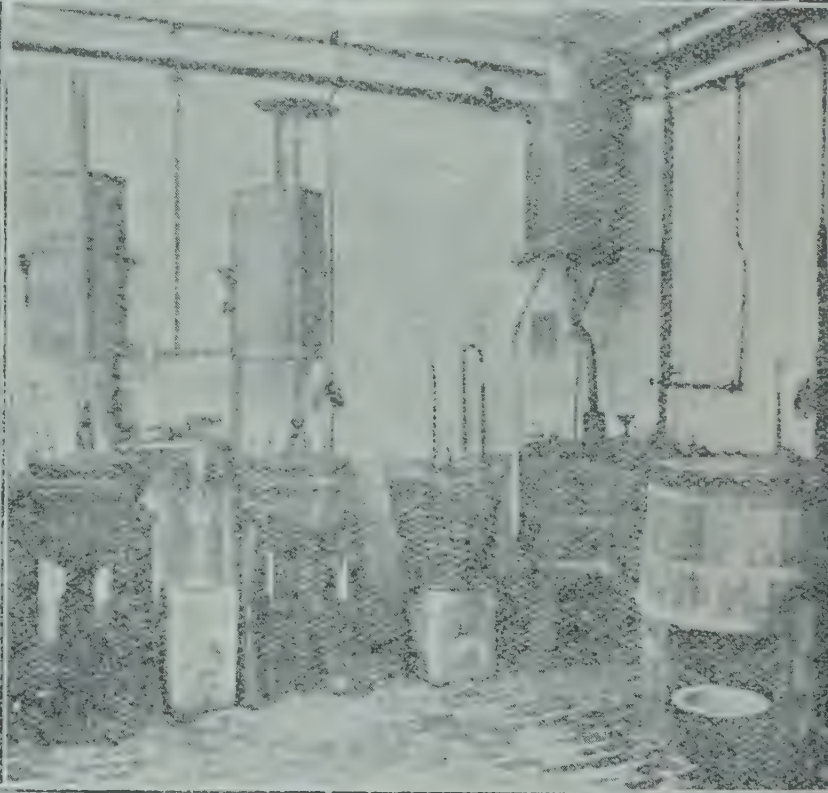
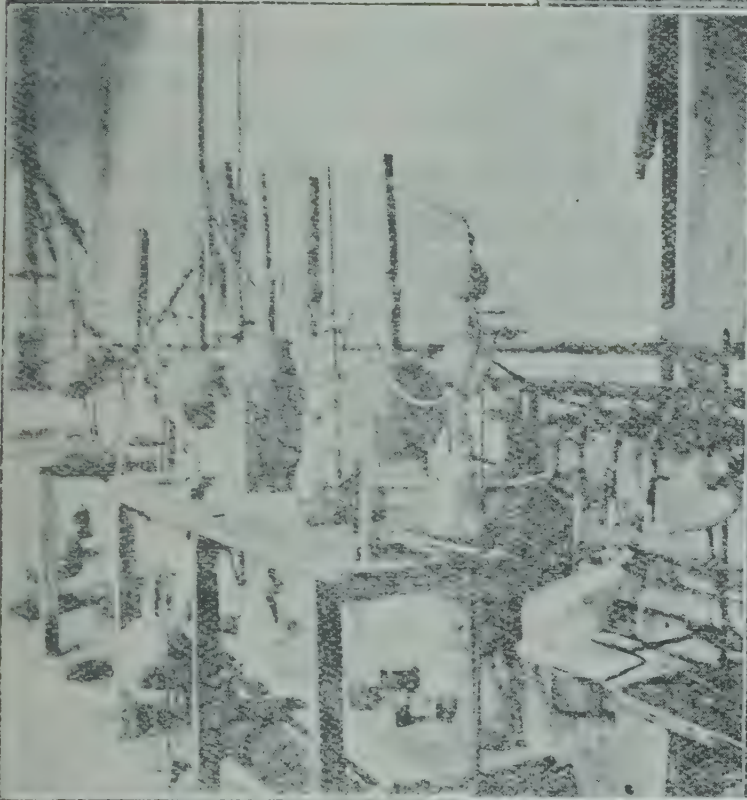
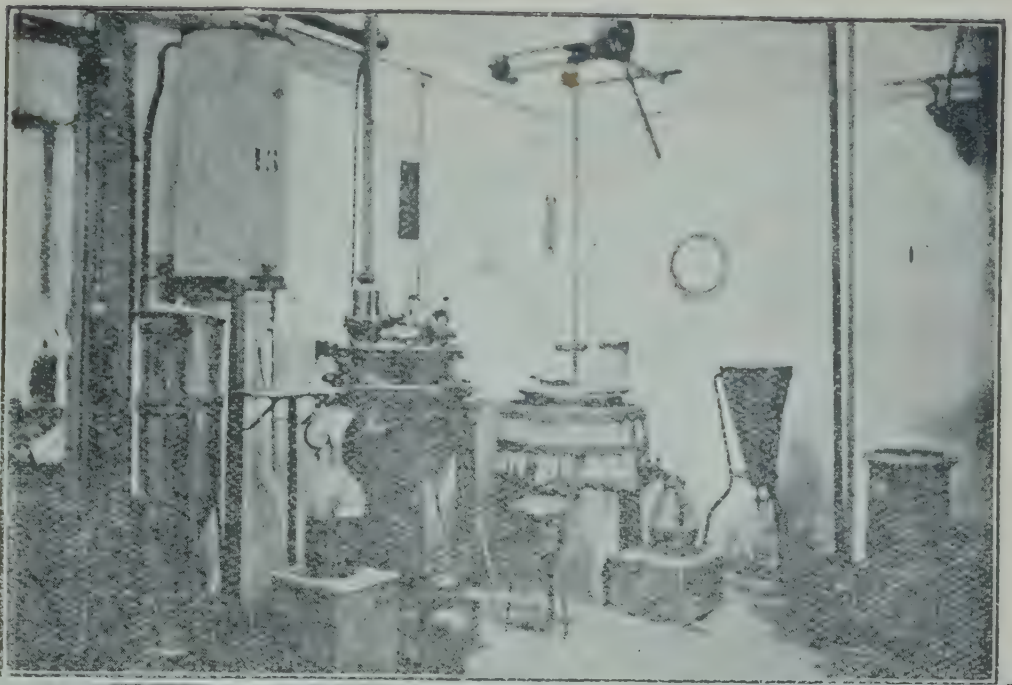
upon temporary check or even defeat as but another spur to the application of new ideas and fresh energy. All this activity requires Initiative, and the thing we call success comes to those who can keep up this ecstasy of promotion.

Success, of course, comes to others as well. Chance has something to say in all our affairs. "Chance," said the great French author, Anatole France, "in the last resort is God." But good luck is dependent chiefly on the happy chance of initiating some new idea. That may happen at any time to any of us. Still it does not do to await upon Chance. Good luck rarely comes to those who expect to be lucky. There is only one safe policy, that is to take luck by the forelock, by experimenting towards the future.

The art of Initiative is to anticipate the next move in the game. If you have a popular article to sell, a newspaper or patent medicine, you must initiate continually new ways of presenting your article to the public, you must anticipate your public's needs. It is the same in any business or profession, he who is first in anticipation is first off in the race, and the rest depends on his staying power. The first dash forward is Initiative, and much depends on the quality of the start.

A good beginning is half the battle. We who are writers know that. An article badly begun stands a good chance of not being read. Those who have spoken in public know also how important it is to begin a speech well; the rest is easy, provided that you know when to stop and how to stop; for ending requires as much Initiative as beginning. With these two acts—beginning and ending—we get very close to the primal facts of life, for everyone wants to begin and no one wants to end. Both are equally difficult—both require courage.

There are no rules for the guidance of those about to follow the path of the initiator save persistence in beginning. Keep on beginning and strive always to begin well. Those who are content with things as they are, must not



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complain if they find themselves side-tracked. The younger generation is knocking at the door of every generation—and youth is ever an initiator—Initiative being the sign of health and the power to grow. But the art of Initiative requires cultivation and care. And there is no cultivation without practice. Everybody who would succeed must strive to make Initiative a habit. He must always be suggesting, experimenting, testing, regardless of failure, for out of a multitude of attempts many must fail but some must win. Initiative therefore must ever keep company with courage. The courage to go on—that is the final heroism. The spirit of Initiative thrives on audacity and it will be found that each courageous attempt only makes the next attempt easier. Audacity sharpens the sword of Initiative, and with such a sword many men have opened the oyster of success.

THE FUTURE OF ESSENTIAL OILS IN MYSORE.

BY MR. S. G. SASTRY, B.A., M.Sc. (LON.),
F.C.S.

THE beginnings of the art of perfumery are to be traced into the hoary days of antiquity, when some “uncivilized” person attempted to possess what was apparently an intangible thing—concealed from the eye, but perceptible to the nose—the hidden perfume of the flowers. We are not, for our purposes very much concerned, with the historical development of the art of perfumery, but we wish to take into consideration the existing conditions of the perfumery and essential oil industry in India, and refer in a general way to some practical lines of development of the industry which is in a sadly neglected state at the present time.

Perfume-yielding materials produced in India offer a very striking example of how the raw materials of the country have so far

been neglected, and how in those instances in which they have been utilized they have been sent out of India, and how often they return to India in the form of manufactured products. Many and varied are the flowers, herbs and roots that grow in India and yield when distilled under proper conditions pleasant perfumes and valuable essential oils. Many such bodies are delicate and perish soon, and hence are unfit for export purposes. They are to be made use of on the spot as soon as they attain the right stage of development and maturity. In cities like Kanouj, Pudukottai and Mysore, the Indian distillers and perfumers make use of them to a limited extent, but the quantity so utilized is very small indeed, as compared with the total production of such perfume-yielding materials. We have neglected this problem too long, and it is high time we made serious attempts to build up an industry, for which the conditions are favourable in India. The first thing to be done is to make a systematic survey of the probable quantities of these perfume-yielding materials available, and then find out suitable spots to set the stills for purposes of distillation. This is a rural industry, the capital required is comparatively small, and any man with average intelligence and ability can manage to operate a still.

To a limited extent India exports essential oils such as lemongrass oil and palmarosa oil. But practically the whole bulk of the perfume-yielding bodies that are not perishable are exported from India and are successfully utilized in foreign countries for “the purposes for which they were designed by Nature.”

The tables at the end of this article give an idea of the position of the Essential Oil and Perfumery trade in India, and an examination of them will show that the trade is of considerable importance to India, and the truth is brought home to us that an industry which rightly belongs to India, has fallen a prey to the Industrial Octopus of the Western nations. Once in its grip it is only those

that have tried that know the difficulty of extricating oneself from it.

There are certain conditions that go to make a nation industrially successful. India lacked them at a time when they were most needed. Commercial enterprise, exploitation of foreign markets, concentration of capital and organization, progress of scientific methods, co-operation of science and industry—all these were practically absent in the Indian industrial system, while the Western nations were gifted with an inheritance in these branches of commercial activities.

Modern scientific progress is entirely due to the hard and patient work of Western nations. Not only do these nations employ scientific methods of production, they are on the alert, day and night, to invent new processes so that the desired article may be produced quicker and cheaper. They also keep their eyes open to the new discoveries made in other countries, and utilize those new things to the best advantage in their own workshops and factories. It is to these qualities that the success of the commercial policy of the Western nations is to be traced. The least we can do at present is to copy the best of these qualities that are essential for success in our existing and future industries.

The present war has been the means of restoring to India one of the most important industries that rested chiefly in German hands. We allude to the distillation of Sandal-wood oil in the Mysore State. In a recent number of the *Perfumery and Essential Oil Record*, Mr. J. C. Umney says, "It is a sound doctrine of political economy that the ideal condition of a given industry is that that country where the raw materials are provided should, in the main, and in the absence of antagonistic influences, be also the country in which the finished article is manufactured from the locally produced raw material." Taking an imperial point of view he quotes the Government Sandal-wood oil factory in the State of Mysore, as a case to the point and adds, further, "Should this

seem to prejudice the English distillers, we at least have the comfort of knowing that it enlarges imperial interests." Before proceeding any further, we would like to draw the attention of the readers to an important and interesting article on the subject which appeared in the *Wealth of India*, Madras, March, 1917, from the pen of Mr. J. P. Srivastava.

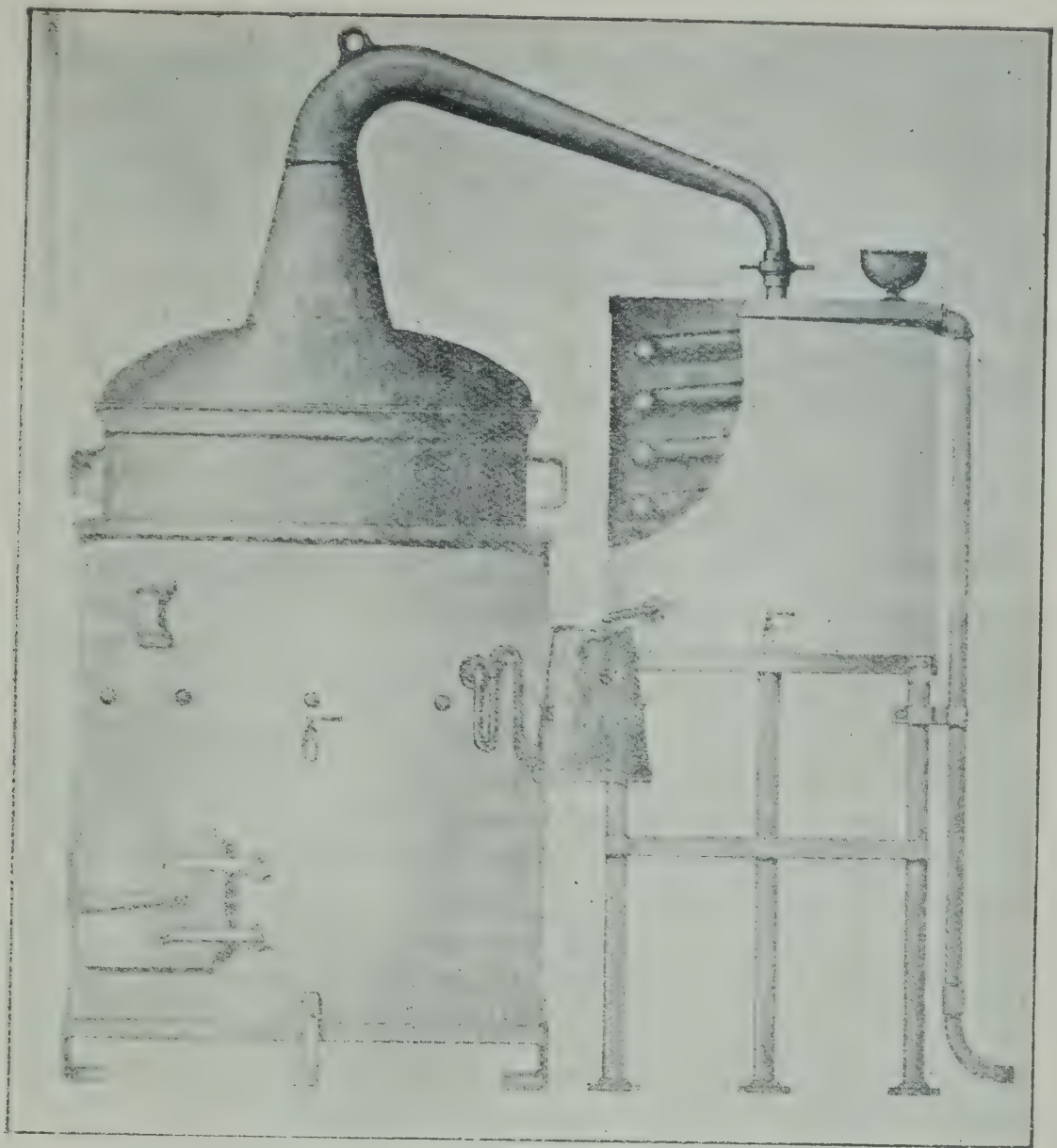
Essential oils are volatile aromatic substances occurring in various parts of plants and they are usually of a very complex nature. In different plants different parts yield the essential oils. For instance, the essential oil is derived from flowers like the rose or jasmine; from the leaves of herbs like the rose mary; from barks like the cinnamon; from certain kinds of grass like the lemongrass of Travancore; from the rinds of fruit like the orange and lemon; from the wood as in the case of sandal-wood; and lastly from certain kinds of seeds like the coriander, cardamom and anise.

The part played by the essential oils in the economy of nature in plant life is not properly understood. In many instances they appear to be merely bye-products in the life history of the plant. It is said that the perfume acts as a source of attraction for insects which take such a prominent part in the fertilization of plants.

The methods employed to manufacture essential oils may be divided into three main classes:—

1. Mechanical processes.
2. Distillation processes.
3. Extraction processes.

Mechanical processes are employed in the case of orange, bergamot and lemon oils, which are obtained from the peel of the fruit. The sponge-process is the one specially employed in Sicily and Calabria, and is, in the main, as follows:—The fruit is first soaked in water for some time, and the peel is then removed in three slices, and each slice is pressed flat by the fingers against a sponge. The oil and with it a considerable quantity



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PICKING ROSES AT GRASSE.

of water is absorbed by the sponge, which is squeezed out from time to time into a bowl, and the oil is then separated from the accompanying water and then filtered.

The *écuelle* process is employed in Northern Italy and south of France. An *écuelle* is saucer-shaped vessel, 8-10 inches in diameter, made of tinned copper, the inside of which is covered with short spikes about one-fourth inch long. The bottom is connected with a hollow tube through which the oil passes to a connecting vessel. The whole fruit is placed in the *écuelle* and by a rapid rotary motion the oil globules are burst and the oil is ejected. An oil of inferior quality is obtained by subjecting the residual fruits to pressure or maceration in water. A still inferior oil is obtained by distillation. There are several modifications of the process, but the principle is the same in all of them, the difference coming in only in mechanical devices.

The *distillation* process is, however, the one that is in most general use. There are several different methods of distillation, such as distillation with saturated, dry or superheated steam, water distillation, and distillation under diminished pressure. The particular process of distillation to be employed depends on the nature of the essential oil and some other economic conditions. In any case the distiller ought to take care that the decomposition of the essential oil under the influence of heat and water should be reduced to a minimum. Some essential oils require rapid distillation and others slow distillation. All these things ought to be determined on individual merits and scientific aid will be necessary.

The distillation process is the one mainly used in India. The stills employed at the present time are very crude and of a primitive type. The condensation of the distillate is inefficient and thus entails a great loss on the distiller. Most of the distillers in India are ignorant of scientific methods. What is

needed at the present time to satisfy their simple demands is a portable still, which can be taken into four or five pieces and which can be re-erected at any required place without any difficulty. The size of the different parts of the still should be such as to facilitate transport in country carts. Obviously it is a still that is to be heated by means of an open-fire. A very important point about its design and construction is that it should have an efficient condenser—in fact, it should be provided with a maximum surface of condensation consistent with the size of the still. Inside the still there ought to be a wire-cage or wire-basket to contain the material that is to be distilled, and the basket should be capable of being adjusted to stand at different heights, so that, it may either be wholly or partially immersed in water, or may stand clear of the boiling water, having access only to steam that is issuing from the boiling water. The still ought to be durable and should be capable of withstanding a certain amount of rough handling, and above all it should be reasonably cheap. There is a big demand for such stills not only in India but in other parts of the world as well. We ought to be able to manufacture them in Mysore—at all events to satisfy the local requirements.

The *extraction* process may be divided into two classes:—

- (1) Extraction by fixed solvents (enfleurage and maceration.)
- (2) Extraction by volatile solvents.

The method of enfleurage or maceration is a very ancient one and is still very widely used in case of flowers whose odours are very delicate, and will not stand a more severe treatment such as distillation. The details of the process depend on the nature of the odorous principles—whether they can resist the action of heat or not, whether the perfume is yielded to the medium or not and so on. The medium employed—both for cold enfleurage or hot maceration process—is a pure variety of some suitable

fat such as lard, tallow or olive oil. Sometimes a mineral substance like pure vaseline is employed. There may be an objection raised in India for the use of an animal fat in this process and a suitable substitute is to be found. It is worth while investigating what vegetable oils and fats produced in the Mysore State are suitable for this purpose.

In the case of hot maceration process the fat is melted on a water bath and the flowers are stirred into it and left over for some time. Afterwards the exhausted flowers are removed and a fresh lot added, until the fat becomes saturated with the perfume material. The flowers are carefully pressed to remove all the fat from them. The resulting solutions of perfume in the fat are known as pomades, and those in oil are known as perfumed oils. If required, they may be extracted by means of alcohol.

In the cold enfleurage process the fat is spread on both sides of a sheet of glass contained in a wooden frame. This piece of apparatus is called a chassis, and upon the upper surface of the glass the flowers are spread. Another chassis is placed on the top of the one charged with flowers and so on. The time required to exhaust the flowers varies in different cases. In the case of jasmine flowers they are exhausted in about twenty-four hours and are removed and replaced by fresh ones, care being taken to turn the chassis over, so that the upper layers now become the lower ones and *vice versa*, so that the saturation of the whole fat is ensured. This operation is repeated until the fat is saturated with the perfume and then it is extracted by means of alcohol and sold in a more readily useable form.

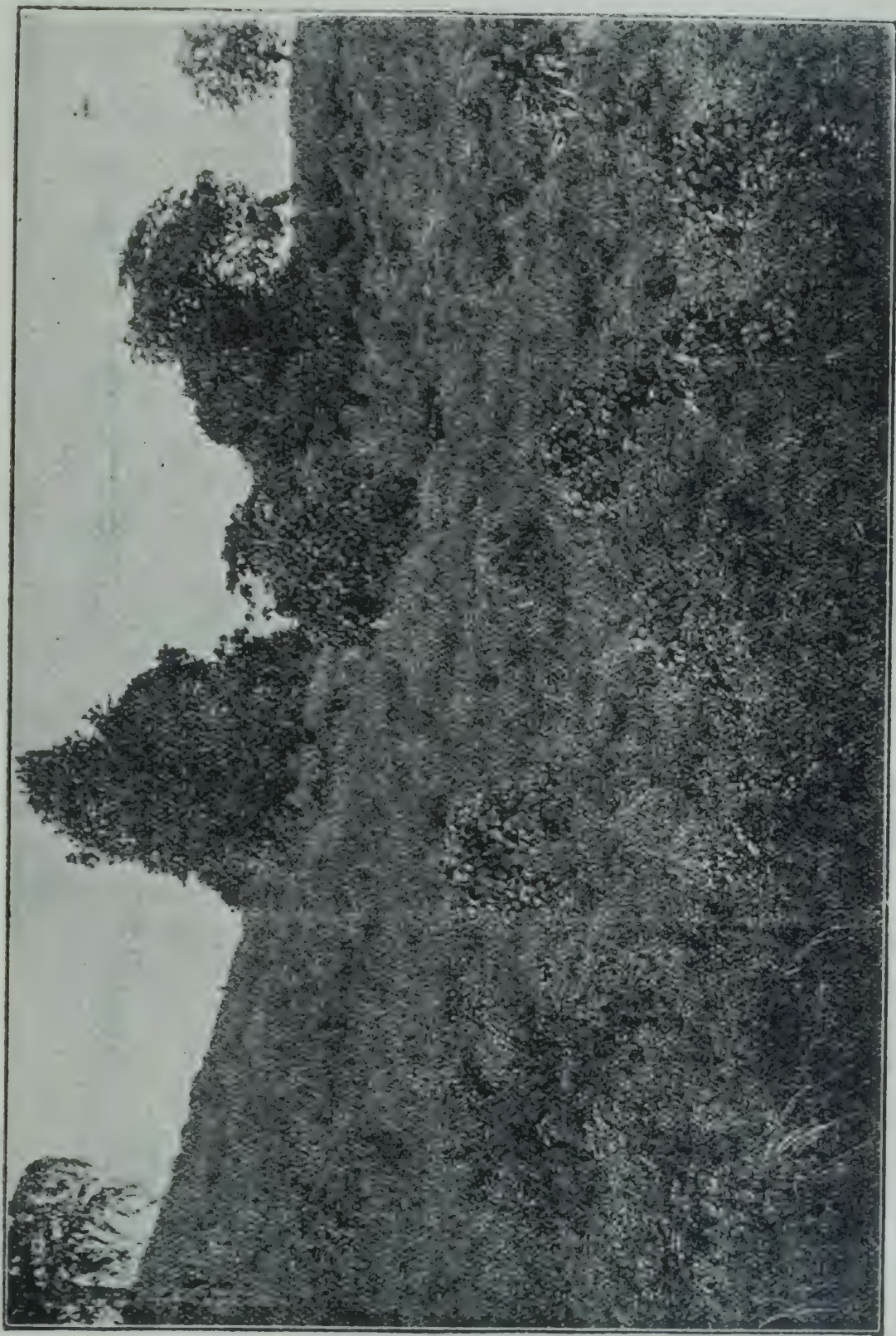
In the next process the odorous principle of the flower is extracted by means of an easily evaporated solvent, and this solvent is afterwards removed from the solution, leaving the perfume behind. Naturally not only the perfume, but all the things in the flower that are soluble in the particular solvent em-

ployed, are extracted, and therefore the selection of a suitable solvent requires great care. Petroleum ether of low boiling point is one of the most suitable solvents that can be employed for the purpose.

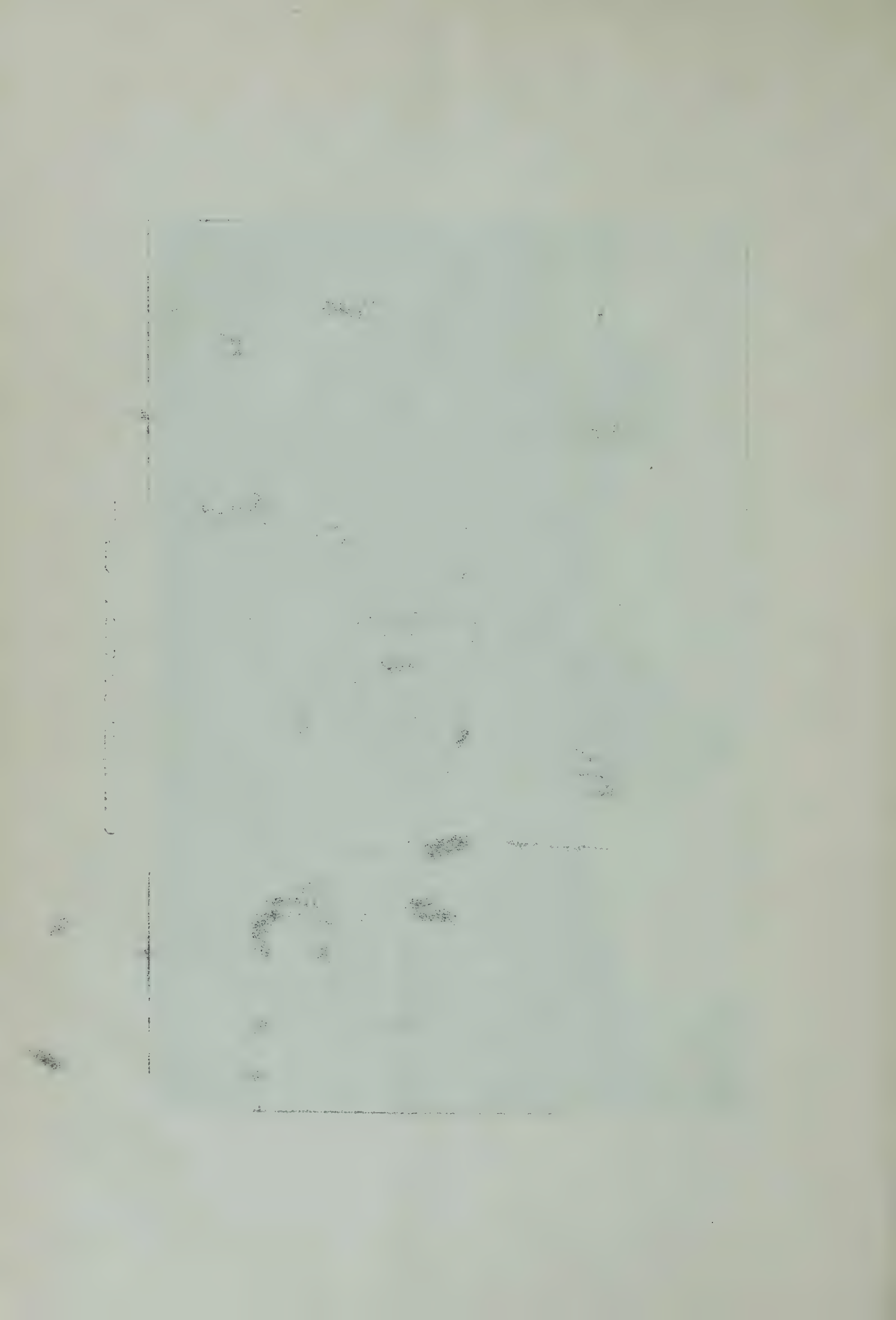
The process of extraction is in the main as follows:—The solvent is contained in a steam jacketed pan, and the vapours from it permeate the whole mass of flowers, and then pass on to a condenser. The solution from the condenser comes back into the original pan, when the solvent is vaporized again and soon completing the cycle. A given amount of solvent is made, by this means, to extract a very large quantity of material. This method of extraction is known as the Soxhlet method. In large factories it is usual to work several of these extractors in batteries of three or more. When the solvent is finally evaporated, the perfume is obtained in a very concentrated form.

"If the conditions of extraction and evaporation have been carefully observed the odorous principles of the flowers will have undergone none of the alterations incidental to distillation and will faithfully reproduce the original perfume of the flower. Theoretically, we may say, that the most perfect method of extracting the perfume of the plant in its absolute form (hence, the word *absolutes* as applied to them in some cases). The perfume is extracted without any fear of alteration through circumstances which are inseparable from distillation and enfleurage processes."—*The Perfumery and Essential Oil Record*. May 11th, 1917, page 139.

The principle methods of manufacture of essential oils are briefly outlined above. In many cases the flower essences as obtained by the above methods are used as such in perfumery, as in the case of Otto of rose. But in several instances, in order to satisfy the demands of the public for fresh effects, 'bouquets' and 'nosegays' are produced by a cunning blending of several ingredients, and diluted by means of alcohol. Almost all



CITRONELLA GROWING IN CEYLON.



the fancy perfumes are produced in this way. Recipes for the blending of such perfumes are often to be found in books, but they are to be accepted with great reserve and should be taken for what they are worth. In many cases, however, they serve as a basis for further experiment and research. Two recipes for Eau de Cologne are selected from Piesse's *Art of Perfumery* to serve as examples.

Eau de Cologne.

First quality—

Spirit (from grape) 60°, over proof	6 gallons
Otto of Neroli (Pétale) ...	3 oz.
„ „ (Bigarade) ...	1 „
„ Rosemary ...	2 „
„ Orange (zeste) ...	5 „
„ Citron (zeste) ...	5 „
„ Bergamot ...	2 „

Mix with agitation ; then allow it to stand a few days perfectly quiet, before bottling.

Second quality—

Spirit (from corn) ...	6 gallons
Otto of Petit-grain ...	2 oz.
„ Neroli (petale) ...	½ „
„ Rosemary ...	2 „
„ Orange peel } of each ...	4 „
„ Lemon }	
„ Bergamot }	

In recent years the demand for cheap perfumes has increased enormously, and the demand could only be met by the use of "synthetic" perfumes. This expression is used in a loose sense by the public for three different classes of bodies. "In the first place there is the true synthetic perfume, that is, one that has been built up from comparatively simple substances by chemical means. Secondly, there is a group of artificial perfume bodies, which, truly, *are* synthetic, but not in the same sense as the first class. They are bodies which by more or less simple chemical means are manufactured from other compounds, complex in their nature, which are found already existing in

other perfume materials. The third class, which may be dismissed without serious consideration, are merely mixtures natural with synthetic perfumes.....The two serious classes of synthetic perfumes may be illustrated by the following examples:—Benzaldehyde, a synthetic manufactured from coal tar products, is a faithful representative of the almond odour. Phenyl-ethyl-alcohol is also made from coal tar sources and is an indispensable ingredient in artificial rose odours. These and hundreds of others belong to the first group above mentioned. But clove-oil contains a substance, eugenol, in itself of a very complex constitution, which can be transformed by chemical means into Vanillin, the true artificial representative of the Vanilla odour ; the essential oil of lemon-grass contains citral, which is in a similar manner, transformed into ionone, the basis of all artificial violet perfumes." (E. J. Parry, *Times Trade Supplement*, April, 1917).

A few years ago the synthetic perfumes were looked upon with suspicion, but it is now recognised that perfumers cannot do without them. The synthetic perfumes have come to stay, and it is only a question of time before the natural odours of flowers, etc., can be faithfully reproduced by means of artificially prepared bodies.

One of the most important uses to which synthetic perfumes are put is in the scenting of toilet soaps. Except in the case of the very best qualities and very costly toilet soaps, synthetic perfumes are regularly employed in the soap-works. As in the case of 'bouquets' and 'nosegays' the blending of the various synthetic bodies to reproduce a given odour, requires a great deal of scientific skill and expert manipulation. The recipes that have been published in books, have to be examined and experimented upon before putting them into use. By way of an illustration, a few recipes for toilet-soap manufacture, are given below from Mann's book *Die Modern Perfumerie*.

Jasmine Soap (first class).

50 Kg of Soap-flakes.	20 g of Artificial musk.
120 g of Benzyl-acetate.	100 g of Infusion of Benzoin.
30 „ Bourbonal.	5 „ Artificial rose oil.
50 „ Linaloe oil.	15 „ Cananga oil.

Almond Blossom Soap (first class).

50 Kg Soap-flakes.	150 g Heliotropin.
250 g Bitter almond oil (Benzaldehyde).	20 „ (art) musk.
30 „ Neroli oil.	35 „ Bergamot oil (art).
150 „ Geraniol (synth).	

Parma Violet Soap (first class).

50 Kg Soap-flakes.	10 g Neroli oil.
66 g Ionone.	30 „ Ylang-ylang oil (art)
30 „ Iris oil (liq).	50 „ Linaloe oil.
250 „ Bergamot oil (art).	100 „ Infusion of Benzoin.
50 „ Geraniol (synth).	3 „ (art) musk.

Lily-Soap (second class).

50 Kg Soap-flakes.	15 g Sandal-wood oil.
80 g Linalool.	10 „ Eugenol.
50 „ Neroli oil (art).	100 „ Tincture of musk.
20 „ Iris oil (lig).	
5 „ Anethol.	

The above recipes are given only as examples to show the use of artificial perfumes in the preparation of toilet soaps and the writer does not hold himself responsible for their reliable character. Warning should be given here that the blending of artificial perfumes should be left in the hands of competent persons, possessing the requisite scientific knowledge, and playing about with them in an unmethodical and unscientific way has resulted in many costly failures.

The potentialities of the essential oil and perfume industry in the Mysore State are very great indeed. Now we have made a successful beginning to manufacture sandal-wood oil, we should begin to look ahead and find out the possible means of extending our activities in this field. In this connection it is very gratifying to note the statement made by Mr. Alfred Chatterton, Director of Sandal-wood factory, Bangalore, India, in a letter of his which appeared in *The Chemist and Druggist*, June 30th, 1917. "In regard to the future, the only definite statement I can make is that the capacity of the factories established by the Mysore Durbar will be gradually extended till they are capable of dealing with the whole of the supplies of

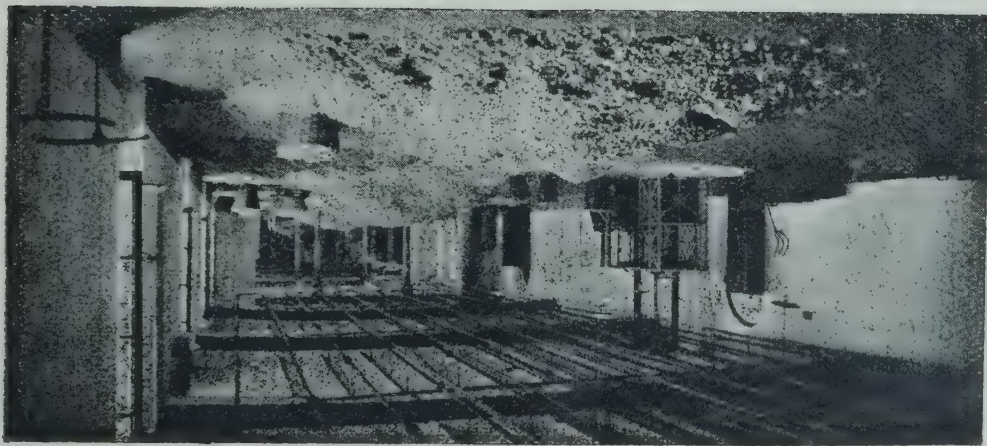
sandal-wood available in the State, and eventually it will be unnecessary to hold annual auctions for wood."

It does not at all do for us to feel self-complacent about our efforts in the new sandal-wood oil factory, but on the other hand, we should realise that the present factory is only the nucleus of a larger and far more extensive concern, embracing the manufacture of essential oils from the raw materials found in the State Forests, and also those cultivated for the purpose. Some practical lines of progress have been suggested in the second part, Chapter XIV of *A preliminary sketch of the resources, industries, trade and commerce of the Mysore State*, and all the steps indicated therein should be taken at once. The cultivation potentialities of the State are clearly set forth in that place and the initial experiments connected with the manufacture of essential oils from the plants mentioned therein, ought to be undertaken immediately at the Indian Institute of Science by a capable chemist deputed for the purpose by the Government of Mysore.

The weaknesses of many an industrial scheme in India are due to the failure to apply scientific and technical knowledge to



PRESSING BAGAMOL OIL.



ROSES FOR ENFLOURAGE.

manufacturing, lack of research and the want of co-operation in manufacturing and selling. We ought to take careful note of these things. New schemes, new processes and new ideals fail frequently, because they get into the hands of people, who have not got sufficient technical advice and assistance to properly develop them. Modern perfume industry is founded on the chemical science and its application. What Organic Chemistry has done for artificial perfume industry is too well known to need a detailed account of it here. Yet it is in its infancy. To-day we are in an age of incessant scientific discovery and the production of essential oils in the State and our power of competition depend on the successful application of the knowledge of chemistry to the perfume industry of the State. Wherever we look, whether in the ordinary preparation of essential oils or in the manufacture of synthetic perfumes, or in the application of scientific agricultural methods in flower-farming—we see great developments of chemistry. If we are to live in competition with other nations, we must keep ourselves alive to these modern

conditions and necessities, not only in actual knowledge but in its practical application to the essential oil industry in the State.

There is many a slip between the laboratory experiment and its successful application on a large scale in a factory. These experiments cannot be undertaken by our local distillers, as is obvious, not only from a pecuniary point of view, but also from the scientific standpoint. It is here that the Government should step in and should undertake to depute chemists to investigate the problems and conduct comparatively large scale experiments at the Indian Institute of Science.

In writing this article, free use has been made of many treatises on the subject, and particularly of the special numbers of the *Perfumery and Essential Oil Record* for the years 1912-1917.

The writer desires to take this opportunity to thank Mr. J. C. Umney, F.C.S., the Editor of the *Perfumery and Essential Oil Record*, for his kindness in going through this article and for supplying the blocks to illustrate the same.

TABLE I.
Indian Essential Oil Trade. Imports.

	Quantities					Values				
	1907 to 1908	1908 to 1909	1909 to 1910	1910 to 1911	1911 to 1912	1907 to 1908	1908 to 1909	1909 to 1910	1910 to 1911	1911 to 1912
From—	gals.	gals.	gals.	gals.	gals.	£	£	£	£	£
United Kingdom	2,353	2,490	2,274	2,759	2,475	6,811	6,754	6,530	8,248	7,583
Germany ...	1,212	1,090	1,338	1,560	1,304	7,126	5,645	7,877	7,800	9,424
Other Countries	7,350	11,234	9,417	9,086	8,816	7,692	7,693	7,523	8,780	10,663
Total ...	10,915	14,814	13,029	13,405	12,595	21,629	20,092	21,930	24,828	27,670

TABLE II.

Indian Essential Oil Trade. Exports.

	Quantities					Values				
	1907-08	1908-09	1909-10	1910-11	1911-12	1907-08	1908-09	1909-10	1910-11	1911-12
To—	gals.	gals.	gals.	gals.	gals.	£	£	£	£	£
The United Kingdom.	5,837	3,495	3,020	3,444	3,237	10,312	4,208	4,912	9,218	8,304
France ...	8,049	6,466	8,125	9,975	15,236	13,147	8,582	11,744	17,746	30,456
Germany ...	5,203	3,095	5,329	4,213	5,640	10,642	6,646	9,584	11,044	15,428
Egypt ...	9,786	11,523	5,780	10,786	9,829	14,048	13,733	9,073	15,315	13,503
United States	1,160	3,213	1,977	1,556	3,197	2,067	4,348	3,542	4,651	6,720
Other Countries.	8,164	4,381	3,756	4,620	4,825	8,808	5,878	4,707	6,033	8,188
Total ...	38,199	32,173	27,987	34,594	41,964	59,024	43,395	43,562	64,007	82,599

TABLE III.

Perfumery Imports to India. Value.

	1907-1908	1908-09	1909-10	1910-11	1911-12
From—	£	£	£	£	£
Persia ...	8,354	10,051	10,390	10,280	8,883
Straits Settlements ...	4,627	4,785	5,049	4,500	3,971
Other Countries (Japan, Germany, U. S. A., England) ...	7,669	10,514	8,794	8,814	13,289
Total ...	20,650	25,350	24,233	23,594	26,143

NOTE.—About 50 *per cent* of the total imports are imported into the Bombay Presidency.

TABLE IV.

Perfumery Exports from India. Value.

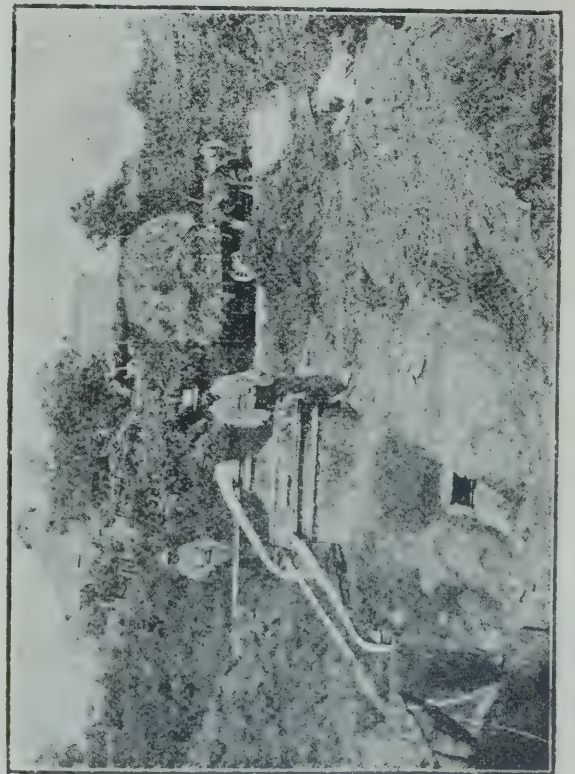
	1907-08	1908-09	1909-10	1910-11	1911-12
To—	£	£	£	£	£
Egypt ...	2,230	1,526	5,353	8,526	5,878
Other Countries ...	8,279	5,386	8,904	9,661	13,392
Total ...	10,509	6,912	14,257	18,187	19,270



ENFLOURAGE FACTORY AT GRASSE (MESSRS. LANTIER FILS).



ROSES FOR ENPLEMAGE.



DISTILLING THYMOL OIL IN SPAIN.

TABLE V.

Essential-oil Seed Exports from India.

Name.					Quantity in Cwts.		Value in Sterling.	
					1913—14	1914—15	1913—14	1914—15
Ajama	...	...	...	...	4,507	2,609	2,953	2,045
Ajwain	...	...	...	...	9,784	7,368	2,983	2,736
Aniseed	...	...	...	...	1,129	835	931	977
Assalia	...	...	...	...	505	170	418	133
Coriander	...	...	...	...	95,533	84,058	39,099	46,327
Cummin	...	...	...	...	19,026	135,54	29,338	25,698
Cummin (Black)	...	...	...	...	1,313	1,411	1,157	985
Fennel	...	...	...	...	15,256	4,223	11,348	3,446
Fenugreek	...	...	...	...	12,760	18,300	7,301	10,161
Sawa or dil	...	...	...	...	2,090	1,945	1,489	1,351
Others	...	...	...	...	147	39	192	43
Total					1,62,050	1,34,512	97,209	93,902

TABLE VI.

Cardamoms Exports.

					Quantity.		Value	
					1910—11	1911—12	1910—11	1911—12
To—					lb.	lb.	£	£
United Kingdom	...	...	...	...	1,16,257	72,726	9,899	5,631
Turkey (Asiatic)	...	...	...	...	21,142	11,428	1,771	1,073
Persian Gulf	...	...	...	...	2,21,521	2,18,398	18,789	20,384
Other Countries	...	...	...	...	3,58,920	3,02,552	30,459	27,088
Total					3,58,920	3,02,552	30,459	27,088

TABLE VII.

Sandal-wood	1913	1912	1911	1910
Offerings at Mysore auctions.	1,564 tons.	1,845 tons.	2,029 tons.	1,662 tons.

AGRICULTURE IN MADRAS,

1916—17.

BY "RUSTICUS."

The Madras Agricultural Department has, from the outset, been singularly fortunate in its Directors and the Report on its operations for 1916-17 shews that Messrs. Couchman and Chadwick have found a worthy successor in Mr. G. A. D. Stuart. The Report is one of progress in all directions. This is especially satisfactory as, though the Agricultural Department Madras has probably not suffered as much as some other provinces from depletion of staff consequent on the war, it is very short of its full complement and cannot hope to attain its proper strength until the war is over. There will eventually be seven circles each in charge of a Deputy Director of Agriculture with an Assistant Director under him but, at present, there are only four Deputy Directors, of whom one is on military duty, and three Assistant Directors. There have, however, recently been two important additions to the superior staff, a Deputy Director of Agriculture for Live Stock and an Agricultural Engineer. The former has still to start regular breeding work as a suitable site for a cattle farm in the Ongole tract—obviously the proper place for it—has yet to be found. The pumping and boring operations formerly carried out by the Department of Industries have now been taken over by the Agricultural Department and these provided the Agricultural Engineer with his main work during the year. He was, however, also working on winnowers, seed drills, spraying machines and improved light iron ploughs so that it should not be long before the appointment has a definite effect on agricultural practice in the province.

Any one who has studied the reports of the various Agricultural Departments at all closely must have noticed the number of experiments that have been abandoned without definite results. Work done at Coimbatore in recent years seems to shew that the time and labour expended on these would not have proved so fruitless if duplicate plots had been taken. It has been found at Coimbatore that, by taking duplicate plots, the probable error of an experiment can be reduced to 3.2 per cent. Mr. Stuart explains that this means that any variation over 12 per cent in the yields of two series of plots can be safely taken as representing a real difference in the factors under test, whilst any difference in the neighbourhood of 3 per cent means nothing at all, as it is just as likely that it is due to chance.

It will perhaps be more convenient and make this review more readable, if instead of following the divisions of the Report, the work on the more important crops is dealt with as a whole. The approaching visit of the Indian Cotton Committee to the Madras Presidency lends special interest to the operations of the Agricultural Department in regard to cotton and we will therefore take that crop first. Madras has its own indigenous long stapled cottons, Tinnevelles, Northern and Westerns and an exotic which has taken a firm hold, Cambodia. The Agricultural Department is not therefore confronted with the question of finding an exotic suitable for introduction and its main aim is the improvement of the yield and quality of the local cottons by selecting pure strains bred from single plants picked out from the local mixed crops. These strains are multiplied and tested on the farms and the best are finally picked out for growing on a large enough scale—some twenty acres—to allow of sufficient cotton being obtained for spinning tests. It is only when these tests are favourable, that a strain is finally selected to be multiplied on seed farms for distribution to ryots.

This work was in progress during the year on all the three cotton farms, Hagari, Nandyal and Koilpatti but it was only at Koilpatti that a strain was evolved suitable for distribution. This strain, which is to be distributed in future under the name of Company No. 3 A, gave the high yield of 171 lbs of lint per acre as against an average for local cotton of about 100 lbs and the spinning tests were also very favourable. One important point raised by Mr. Stuart is the danger of cultivating a pure strain bred from a single plant over a large tract, as if the season is unfavourable to the strain, the whole crop is adversely affected. The Department is therefore experimenting with a view to testing whether a mixture of the best types will not give a better yield in the long run than the best pure types. It will obviously be a long time before any conclusions can be drawn. The opinion of the trade as to the quality of the cotton thus evolved will doubtless be obtained before it is finally decided to distribute it to cultivators.

Nearly two thousand acres in the Bellary and Kurnool districts were sown with two strains of cotton evolved in the manner described above, Sircar Nos. 1 and 2. The outturn was, however, poor, 40 lbs an acre only as against 50 lbs for local cotton. This was partly due to the season, the rainfall in the Ceded Districts being from two to three times the normal, but Mr. Stuart is evidently uneasy in regard to the probable success of these selections. As he says, the yield of lint is the important matter to the ryot, as the difference in price between the long and short staple cotton is not sufficient at present to compensate for the poorer yield of the former. In the cotton growing tract which produces "Northerns and Westerns", the Agricultural Department has, unfortunately, not yet been able to find a strain combining long staple with high yield, the two qualities being, seemingly, mutually exclusive. It has therefore nothing to offer the

ryot in preference to a high yielding short staple cotton such as the *roseum* of the Central Provinces which made its appearance during the year near Adoni and gave a remarkably good outturn. The problem of securing the cultivator a price sufficiently high to induce him to grow cotton of longer staple is one on which the investigations of the Cotton Committee should throw some light. Meanwhile it is to be hoped that the Madras Agricultural Department will not relax its efforts to evolve a superior type of "Northern" or "Western" cotton with a sufficiently high yield to enable it to compete successfully with *roseum* for it would certainly be somewhat of a disaster to an important section of the cotton trade in this country if those two well known types were to be supplanted by *roseum*. That the problem is by no means insoluble, the successful eradication from the cotton fields of Tinnevely of *pulichai* which is, we believe, only *roseum* under another name, is sufficient evidence. As Mr. Stuart very soundly remarks, the first of the methods adopted to fight it, combination amongst the buying firms to refuse to buy it would have been bound to fail in the end without the help of the second, the supply to the cotton-growers of the seed of an improved indigenous cotton, Company No. 3, which yields the ryot a better return per acre than *pulichai* does. Mr. Stuart fully recognizes what is apt to be overlooked by people in a hurry to get long staple cotton from India, that there is not the smallest shadow of justification for preventing the ryot from growing the crop which he thinks will pay him best. The true line of attacking the problem is to find him a cotton of the requisite length of staple which will pay him to grow and there will be no difficulty in persuading him to grow it. The way in which *pulichai* has been driven out of Tinnevely reflects the greatest credit on all concerned, the Agricultural Department, revenue officers and buyers alike.

More than 550,000 lbs of the seed of the cotton which has proved such a successful counterblast to *pulichai*, Company No. 3, and of Company No. 2, the yield of which, though not nearly so good as that of Company No. 3, is higher than that of ordinary Tinnevely cotton, were sown in 1916. This quantity was sufficient for about 56,000 acres. It is interesting to note that, in addition to expanding the system of joint sales and joint ginning, the Madras Department has made a beginning with the Seed Unions which have proved so successful in the Central Provinces. These Unions consist of a certain number of ryots—in Madras the number is five or six, in the Central Provinces we believe it goes up as high as twenty—who undertake to sow the whole of their cotton area with seed selected by the Agricultural Department and to keep the seed for sale for sowing in the next season. The members are financed, if necessary, by the local co-operative societies of which they are members. They are supplied annually with fresh seed of selected strains sufficient to sow one-twentieth of the total area annually sown with cotton by the Union. The seed is sown by one member on his land as a Union seed farm and the resulting seed is used in the second year for the whole Union. Mr. Stuart looks forward to an extension of this system which would enable the Department to cover the whole cotton tract of 600,000 acres with improved cotton in three years.

In regard to paddy, Dr. Harrison continued his important but highly technical investigations on the subject of gases in paddy soils. Of two new strains tested at Coimbatore, one, No. 24, was a success yielding 3,600 lbs per acre and giving a grain yielding a high percentage of husked rice. One old strain also tested at Coimbatore, Sadai Samba 20, gave the magnificent yield of 4,800 lbs of paddy to the acre from a ten cent plot. An interesting exemplification of the fact that imported strains,

whether of paddy or of other crops, are apt to adapt themselves somewhat too readily to a new environment was provided at Palur, where twelve short duration foreign varieties of paddy from the Central Provinces tested since 1910 with a view to the discovery of one which would be suitable for lands with a precarious water-supply have tended to become of longer and longer duration. Many of them now take a month longer than the local varieties to come to maturity. They are, in consequence, now being discarded. The demand for selected strains of seed paddy from the farms increased whilst the economic transplantation of paddy continued to spread, especially in the Coimbatore District.

It is so eminently desirable that India should depend to a much less extent than she does at present on foreign sources for her supplies of sugar that the development of sugar-cane cultivation in the Palghat Taluk of the Malabar District, where Messrs. Parry and Co. have put up a milling and jaggery making plant, and also in the South Canara District is worthy of mention. In the latter case, the development is mainly due to the introduction of the hard Red Mauritius cane which is comparatively immune from the attacks of wild animals. That cultivators do not always know what is best for themselves and that there is a danger that the Agricultural Department may accede somewhat too readily to their wishes is shewn by the action of the ryots in the deltaic tracts of the Circars who clamoured for a variety known as B 3412 on account of its high yield. The Agricultural Department, evidently against its better judgment, distributed this variety but experience shewed that it was delicate and liable to disease and it has now been decided to distribute a variety known as J 347 in future.

We have left ourselves little space to deal with other crops. Selection work on cholam, ragi, cumbu, and Italian millet was done at various stations but the results are not yet

by any means as evident as in the case of cotton, sugar-cane and paddy. The visit to the provinces of Mr. Davis, the Special Indigo Research Chemist, should have an important effect on improving the methods of manufacture and possibly also the reputation of Madras indigo. Mr. Ballard, the Government Entomologist, was absent on military duty and possibly for this reason, no remedy was discovered either for the fresh water crab pest which attacks paddy at Manganallur or for the cotton stem weevil which has proved very destructive to Cambodia in the Coimbatore District.

The Agricultural College was happy in that it had no special history during the year. The full effects of the recent change in the curriculum, an account of which has been given on more than one occasion in these columns have yet to be experienced. Evidence of the increasing popularity of the College is furnished by the fact that there were 268 applications for admission to forty-two vacant places.

The Madras Government sanction the proposals of the Director of Agriculture, Madras, to rent, with effect from 1st April 1918, for a period of five years in the first instance, 1774 acres of land in Mel-Alattur village, near Gudiyattam, in the North Arcot district, for opening a farm at which the following improvements will be demonstrated to the ryots:—

- (1) Paddy improvements: better transplantation; growing of green manure crops; introduction of new varieties;
- (2) Sugar-cane: new varieties and improved cultivation;
- (3) Coconuts: better cultivation and manuring;
- (4) Introduction of Cambodia cotton;
- (5) Use of monsoon plough;
- (6) Collection and preservation of cattle manure.

FREE SECONDARY EDUCATION FOR MYSORE.

BY MR. V. SUBRAHMANIA IYER, B.A.,
*Secretary, Education Committee, Mysore
Economic Conference.*

AMONG the enlightened countries of the world that have realized the national importance of "Free" Education, the United States of America, Denmark and Switzerland appear to have made not only their Primary but also their Secondary Schools free, though the two former have gone a step further and made even University Education available without the payment of tuition fees. England has now been taking steps to educate her children in the Secondary stage also at public cost. And Germany is said to be seriously contemplating a similar measure of reform. In Switzerland and Denmark, however, there are still some schools of the old type which levy fees; but they generally answer the special needs of particular sections of the community. In India, Baroda, Mysore and a few minor Native States have been providing Primary Education gratis for some time past. And at the present moment, an attempt is being made in Mysore to have the fees abolished in the *Secondary* schools also. This subject, the people brought up at the last session of the Mysore Representative Assembly and discussed at some length. But they arrived at no definite understanding.

I

The specific question whether *Secondary* Education should be free largely depends, for its solution, upon the arguments bearing on the general subject of Free Education. And turning to it we find that in most countries two leading doctrines govern their educational policies in the matter of levying fees:—

- (a) The old doctrine that he who wants Education must pay for it; and

(b) the new one that every citizen, whether he pays or not, must have his Education.

The former principle views education from the standpoint of the individual; whereas the latter considers it from that of the community or the nation. And of the former principle, there is also a modification which lays down that "Those that *can afford* should pay". But this view totally ignores the case of the large numbers who are devoid of the requisite means, and it therefore takes little note of the National standpoint. The more men approach the latter, *i.e.*, the National, which is the modern, the higher, the more they realize, that the 'fee-paying' principle is

- (1) repressive and retardant,
- (2) inconsistent and illogical,
- (3) inequitable and unfair,

and above all (4) suicidal to national well-being.

The old or the individual standpoint has a fascination for the conservative spirit in man. Many still cling to it shutting their eyes to the fact that the world in its onward march will neither go back nor make a halt for them. The nation or the community, but not the individual is its next goal. If the ubiquitous and ever-increasing struggle for existence has taught us one lesson more than another it is that education is one of the most vital of the factors making for national preservation, with which is linked individual preservation. Every one is familiar with the arguments of the economists for public and national education. And the students of history know that hardly a day passes without some fresh force and significance being added to its claims. Every great historical event of modern times adds corroboration to the truth that a "A nation can no more afford to be behind in its schools than in its armaments. Both in the broadest and in the narrowest sense, men are more than armaments." After the Franco-Prussian War of 1870, almost the first sub-

ject to which both France and Germany directed their thoughts was Education, particularly their famous University and State Education Schemes. The South African War, at the beginning of the present century, gave a special impetus to reforms in Technical and University Education in England. After the modern conflicts with the European Nations, both China and Japan initiated their great schemes among which were provisions for training large numbers of young men in the modern sciences. And now proposals of a momentous character are laid before the public in England, with a view to their adoption after the Great War. Even Germany is, they say, thinking of a 'Post-War Educational Reconstruction'.

Not only the great calamities of war that befall us at long intervals, but also the small tragedies perpetrated in peace every day, by men as well as by nature, have made the thoughtful among enlightened nations rally closer round the bloodless banner of Knowledge to wage the greater war, the war against Ignorance. They have understood the better the simple truth that, in every kind of struggle for existence, it is the men without brains that ultimately go to the wall and that of national as well as of individual assets the most reliable and the most permanent are men's intellectual resources. The cry everywhere is for efficiency: every nation wants not only efficient thinkers but also efficient workers. Education being the only universal high road to efficiency, to day the training of the citizen is become a foremost concern of all civilised States. And every citizen in them claims education as a "Birth-right". His war cry in the daily struggle is "free and equal educational opportunities."

Time was when education was held even in the most advanced countries to be only a matter of individual interest. It was then treated as an article of commerce and sold to him who paid the price for it. When it was realised that education was of the greatest moment to the well-being of the community,

to educate the citizen came to be considered as important a duty of the State as to make provision for the protection of the citizen's person and property. In fact, it is now held that no protection of person can be rational which takes into account only the physical body leaving the mind uncared for. Among the most advanced communities every individual gets the benefit of education as a matter of right, irrespective of his payment; while among the least enlightened, he can only buy it, paying as high a price as he can or as is demanded. And there are many intermediate stages in which the state or some local body, public or private, provides the requisite educational facilities and meets part of the cost, the individual being made to purchase it at *reduced* or concession prices, while those who cannot afford to pay any fee go without any education, a few however, here and there, being helped with scholarships. The evolution thus appears to be from education as a *commercial commodity*, to education as a *primary duty* of the State or the community.

(1) In countries still dominated by the old, *i. e.*, the commercial principle "Pay and you shall have", what general rise in the standard of efficiency can the great body of the majority, which is generally constituted by those who cannot make the two ends meet, attain, and what opportunities can they create for themselves, with their necks loaded with a mill-stone, *increasing in weight*, as if with a vengeance, at every step in the educational ladder? The more the poor man reveals his capacity for learning and for being serviceable to himself and to the State, *i. e.*, the higher the stage to which he rises, the heavier are made the fees and the more vigorously is his education discouraged. As a remedy, the provision of scholarships and free studentships has been tried. But though it has helped the advancement of stray individuals, in a community, yet as an instrument for developing the efficiency of the nation and for increasing

the enlightenment of the community as a whole it has proved altogether ineffective. When the bulk of the actual workers of the community are thus treated, what head can it hope to make in the great struggle for existence? Modern countries naturally, therefore, repudiate the repressive commercial-spirit in which *education is sold in the same manner as intoxicating liquor is sometimes vended: the larger the quantity consumed the higher the rates charged!*

(2) Next, it would be a great mercy, if Education were at least dispensed on a purely commercial principle and if the rates of fees were proportionate to the benefit derived by the pupil. But he that derives the least benefit has to pay the same fee as he that reaps the greatest advantage. Is this consistent?

(3) The accredited principle of the 'Equality of Burden' which gives to the levying of public taxes its character of justness is ignored in the case of Education. The child of a parent earning a thousand a month pays fees, *not according to the parent's means*, but just in the measure in which the child of a parent earning only ten, nay, earning nothing, pays. Are not the rich thriving at the cost of the poor? Is this fair or equitable?

(4) There is an ever increasing demand for hands with better qualifications not only in every department of the State, but also in every private concern. But the cost of education is equally rapidly rising every day. If the higher qualifications could assure increased earnings, the course followed would be just. But the glut in the market of educated men naturally lowers the wages. Countries industrially and commercially developed provide a large number of openings with improved prospects to the young. The *average* Graduate here, however, twenty or thirty years ago obtained his education cheap, started on higher salaries with much better chances. And now, he has to lay out more money on books, hostels and fees,

nevertheless he is offered hardly half the initial pay and has a far less attractive future. Of course, we must let alone those few with more than average intelligence, who are exceptions and who therefore command much higher incomes. In the absence of scope for increased earnings is not the *average* pupil who spends money on education, *in the existing circumstances of this country*, investing his capital on an enterprise which brings him only *Diminishing returns*! Would this fact, when fully understood, help to stimulate the advancement of education among the majority? In fact, a number of parents have actually withdrawn even their intelligent children from Secondary schools, merely because the return is poor.

It may be argued that Education should be sought, not for bread alone, but for higher ends. But whatever the ends, those that seek them must have the requisite means to pay the cost. In this country, does the average income of the *majority* improve *pari passu* with the increase in the cost of Education? Rather, do their earnings rise proportionately with the increased cost of living so as to leave a sufficient margin to meet the increased demands of Education? The present scramble and fight for free-studentships and scholarships in schools is an ample index of the economic situation.

Even among the middle classes who no doubt can afford to pay but whose means are limited, it not frequently happens that a parent has three or four children, but can pay the cost of education of only one of them, probably the eldest. And the rest, or the younger ones, who more often than not, happen to be more promising and capable, have to go without the benefits of such Education as would make them not only better wage-earners but also more efficient citizens. Neither can such misuse of funds in investing them on the less promising members, leaving the more hopeful

ones uncared for be completely avoided, nor can the advantages of turning to the best account every available talent in the community be fully secured to the state under the paying system.

In brief, if education is of interest not merely to the individual but also to the state or the community, if Education is to be recognised as the best means of developing the most valuable of national resources and so justifies the largest state investments on it, if it is not to be worked on the principle of Diminishing returns, if it is necessary that all the individuals should be educated that the community may not die out, if Education is to be recognised as the 'Birth-right' of every citizen, and above all, if it is not to be iniquitous in its dispensations to the rich and the poor, can it be otherwise than "Free"? And if it is to be free, who should pay the cost?

So long as education was considered only an affair of private or individual concern, little public money was being expended on it. But as the struggle for national existence increased and as success in it became more and more dependent on the intellectual attainments of the community, public funds were diverted into this channel, though at first in small sums. Now-a-days the cost of education is one of the first charges upon the revenues of the state. Public investments on education are reckoned among the most profitable though the returns are generally slowest. The value of education has risen so high and the need for it so keenly felt, that it is deemed perfectly right on the part of the state, not only to compel its citizens to be educated but also to relieve them, not in part, but in entirety, of their obligation to *purchase* it. For, it is further realised that it is not merely the general rise in the level of intelligence that pays the community the best dividends by raising the standard of efficiency all round. The production of even a single leader of industry, of commerce, or of science, is often actually found to be

a greater return for the investments made. And for discovering such leaders and geniuses who are born more often among the poor than among the wealthy, educational opportunities are indispensable, to provide which is one of the foremost duties of the state. And funds are, therefore, found not only out of the endowments of charitable bodies and men, but also out of the local or municipal taxes and the revenues of the state, according to local economic and social conditions. For this great national purpose, every source is tapped.

II

So much for Education without payment, in general. Without belittling the importance of Primary Education, as a factor of national progress, it may be observed that Secondary Education, has a higher *current* value and therefore demands more urgent attention. Though Primary Education is concerned with the largest number, yet as it deals only with that part of the community that is below the age of ten, whose character is yet to form, who are inadequately equipped as workers and breadwinners or with adults whose understanding is little developed, its influence on current national life is not appreciable. On the other hand, Secondary Education deals with youths in the heyday of their enthusiasm and spirits, at a stage in which their character is best moulded, when their mind is most impressionable, and therefore most responsive to appeals for service of every kind. Even on the battlefield some of the finest deeds done are those of adolescents of the age of pupils of Secondary and higher schools. It is directly after their training in the Secondary schools that they go out into the world to earn a living; and everywhere experience shows that it is the instruction given in the Secondary and Higher stages that turns out really efficient workers. Moreover, those that enter upon these stages constitute comparatively a *select* body possessing capacity

of a higher order than the great mass, who discontinue at the primary stage. The money spent upon them, therefore, is bound to bring in a more immediate and a more substantial return to the State. They can influence the progress of the country in a more sensible degree not only by their increased earnings and their more selfless service, but also by their more intelligent co-operation in every department of life. And yet, it is they that have to pay higher fees! Does their case, not in reality, then require aid from the state more urgently? Is their education not in greater need of being made "Free" at this hour?

Now, if the principle of *Free* Education is agreed to and if the importance of *Free Secondary* education is admitted, the entire question of its adoption will turn upon the one point of the provision of funds.

No doubt, there is the subsidiary question of Private or Aided Institutions. But unlike other countries, Mysore has more State institutions than Private. All the girls' schools being practically free, they may be left out here. There are about 301 Secondary schools for boys, of which about 200 are State and about 100 Private or Aided. Whether these private or aided institutions should continue to levy fees or should cease to do so is a matter for the schools themselves to decide. Both in Switzerland and in Denmark, fee-levying schools exist by the side of free schools, the former answering as in Denmark, the special needs of certain sections of the community. In Mysore, past experience shows that 'Free' schools do not kill fee-paying schools. The strength in the Primary private institutions which levy fees has not fallen though the State schools of that grade have been free for several years past. Further, as was pointed out, Girls' education, in all stages, is free. Nevertheless, some aided institutions have been throughout collecting fees, which that the parents have been paying without any demur. And there is no reason to suppose

this reform will empty the higher private institutions unless they also abolish the fees. The poorest pupils may leave, but the better classes may seek them if the schools be only efficient. In fact, this new measure may improve the inefficient among the fee-levying schools, as it is said to have sometimes done in other countries. If, however, there should be an appreciable decline in the strength of the aided schools, so as to affect seriously their existence, it is but fair that Government should compensate them by means of special Grants-in-aid, *till the financial equilibrium of these schools is restored*. But it is not possible to estimate at present the probable amount of compensation. Some additional provision, under Grants-in-aid must, however, be made to meet this contingency.

Turning to State schools, we find that the amount of fees collected last year was Rs. 1,39,769 or Rs. 1,40,000 (in round figures). Deducting out of this, the sum of Rs. 21,000, which is roughly the amount that the Government have been pleased to remit by increasing the number of free-studentships in the Secondary schools, there will be left about Rs. 1,19,000 to be relinquished, which is the additional charge that the proposed step will probably entail. The total expenditure on Education in the State last year was about Rs. 33,00,000, the net annual cost to the State being about Rs. 22,10,000. To this latter amount about *a lakh and a quarter* may, therefore, have to be added.

During the past six years the annual expenditure under Education has risen from Rs. 19,50,000 to 33,00,000, the average increase being over two lakhs. This item of a lakh and odd may not be too big.

Now, in countries like the United States, which are enjoying a large measure of economic prosperity, individuals or private bodies can afford to make educational endowments on the requisite scale. But in States, like Mysore, which are just at the threshold of economic developments, such contributions from private sources are impossible.

To wait till men here grow as rich as they in the United States is to wait with a view to being wiped out of existence. Neither Denmark nor Switzerland has thus waited for private endowments to come for this purpose. People in Mysore must, like their brethren in these smaller countries, fall back on public resources such as Provincial funds, Local funds, and Municipal funds. If these items of income cannot admit of the additional charge, in the interests of the country, recourse must be had to special taxation, as the only other alternative.

At the last meeting of the Representative Assembly, the members expressed their readiness to vote the amount required for making Secondary Education free, out of the Income-tax proposed to be levied. But as this new impost will draw upon the resources of only a section of the community and as the benefits of free education are participated by the entire body of citizens, the additional expenditure must, in all fairness, be met out of the general resources, *i.e.*, the Provincial Revenues, the Local or Village funds and the Municipal funds. And it is for the public to weigh well the situation and to lay before the Government their suggestions as *early* as they can. *Let not the fact be overlooked that every year hereafter it would be increasingly difficult to effect such a reform.*

The glory of having first enunciated, in modern times, the doctrine of "Free" Education in all stages belongs to the United States. She believes in it and acts on it. Denmark has followed her great example and has made remarkable improvements of a most far-reaching character, for eliminating wastage of public funds, which sometimes occurs in working systems of universal education. Other countries are trying to develop on the same lines.

And in India, what an irony of Fate that "Free" Education should be looked upon as a foreign idea or a new experiment! And that the people should delude themselves into thinking that they are not prepared for

it yet! India is the *first* country known to History, which not only evolved a system of 'Compulsory' Education but also laid down and adopted in practice the principle that education should not be *sold*, but should be a *free* gift. Even to this day, *after thousands of years*, the expression '*Vidya Dana*'—not '*Vidya Vikraya*'—continues to be used. But the spirit of it is almost gone. And it is nothing strange that in the very land of its birth, the idea is become an utter stranger!

To ask constantly whether others have had the courage to adopt measures of reform and to wait habitually till others have made experiments that we may profit by their labours, only argue a want of virility in thinking and imagination and an absence of the power of self-reliance. The greatest drawback of the Indian mind, as recently observed by an eminent American professor, an ardent admirer of the Indian intellectual superiority, is its over-cautiousness. Is it not time then that we woke up to a full sense of the weaknesses that hinder our progress? In modern times Baroda has had the credit of having been the first to make *Primary* Education free. And may not Mysore have the honour of being the first in India to make *Secondary* Education free? Would such a step be incompatible either with true Indian instincts or with the noble traditions of Mysore, whose Sovereign, Sri Mummadi Krishnaraja Wodeyar Bahadur, one of India's greatest patrons of Learning started, as a '*Free*' Institution in 1833, the English School, which has now developed into the University of Mysore?

It is stated in the *Board of Trade Journal*, (1917, 96, 785) that a firm in Cape Town has been granted the exclusive right to manufacture pulp for paper from the baobab tree (*Adansonia digitata*) in Mozambique on condition that works are started within two years from the date of the concession.

MANAGEMENT OF DISTRICT FORESTS.

BY MR. P. S. GOVINDA RAU,
District Forest Officer, Mysore.

IN the Mysore State, all waste lands are the property of Government. The term "*District Forest*" as defined in the Forest Regulation, includes all land at the disposal of Government not included within the limits of any State or Village Forests, and not assigned at the time of Survey. Settlement for the purpose of free grazing or for any other public or communal purpose. The management of these tracts is vested in the Deputy Commissioner in virtue of his position as the head of the District. The position of the Conservator with regard to this class of forests is purely that of an adviser, although he is vested with general control in regard to Forest Administration. These District Forests are burdened with privileges and rights in the matter of removal of fire-wood, agricultural implements and grazing. It would, indeed, be no exaggeration to say that the "*District Forests*" in actual practice seem to be no-body's land and are freely denuded by the surrounding villagers who are invariably repugnant to the very idea of afforestation to the chagrin of conserving department. The Deputy Commissioners, in view of their multifarious and exacting duties, hardly find time to pay any appreciable attention to the abuses in the District Forests. The powers of the Amildars with regard to the management of these lands are nowhere clearly defined, though in practice they are expected to be the wardens of the District Forests of the Taluk just as much as the Deputy Commissioners are of the forests of their District. The District Forest Scheme frames a set of rules for the working of these forests; but the initiative in the matter is

required to be taken up by the Deputy Commissioners inasmuch as the Forest Code does not expressly state what the powers of the District Forest Officers are, with regard to these forests. The District Forest Rules provide, as stated above, for certain concessions to the surrounding villagers in the matter of removal of forest produce for *bonafide* domestic use. The rules also require Patels of villages to watch that the privileges are not abused and to see that right use of the forest is made. But at present, there is no effective pressure of the official superiors on the Patels and in consequence, the Patels disown their responsibilities in the matter of these forests and are somewhat indifferent. The result of this system of unregulated and unclassed working has been that many a valuable forest clothed area which encountered the severest opposition to afforestation at one time, has now been completely denuded of its forest growth. The complete denudation of others is only a question of time. Practically the District Forests form the plundering ground of unlicensed and uncontrolled villagers to satisfy their unrestricted wants and wastes. The existing rules on the subject expressly provide that the Deputy Commissioner before passing any order or introducing any change of practice which might affect the general management of the District Forests, should consult the Conservator of Forests. There does not, however, seem to be a single instance in which the Deputy Commissioners have undertaken an organized system of working or consulted the Conservator of Forests in the matter. The Deputy Commissioners are unable to undertake any detailed inspection of District Forests in the midst of their heavy administrative and executive duties and adopt such measures as may be required for the better working of these forests.

It might be argued with some show of reason, that the District Forest Officers as the Chief Assistants to the Deputy

Commissioners may do much to prevent the present abuses and introduce a systematic working scheme for these forests on a rational basis. Under the present system of undefined responsibilities of the District Forest Officers, with the strong predilections of the rural population to reckless use of the District Forests under what they believe to be their vested rights and hostile attitude to the ordinary notions of forest conservancy, it would be very hard to take in hand any such proposal without the real co-operation of the Taluk wardens. This position will be clear to one who realises the hard actualities of the situation. I may also say, without fear of contradiction, that any comforting statements that might be advanced by apologists of the present system regarding the better working of the District Forests under the present conditions, are, I respectfully venture to state, without a warrant in the actual facts of the situation. In discussing the present relations of the "District Forests" with the Forest Department proper, an attempt has duly been made to show that the existing conditions are not congenial to the rational working of the area and to develop the forest resources.

Mysore forms the home of sandal which brings in the bulk of forest revenue to the State Exchequer. Sandal is chiefly and abundantly met with in the District jungles and the village lands. Though more than 2,500 tons of dead and fallen sandal-wood are extracted annually, 95 per cent and more of this comes from the District Forests, which form its chief habitat. In the present state of the management of District Forests, there is very little protection for this royal tree and the gold-producing product of the Forest Department. The Forest Revenue of the State depends in a large measure on the growth, development and exploitation of this valuable wood. The scientific propagation and tending of this valuable tree is entrusted to this Department. In the District Forests, this tree is exposed to various

injuries which are not only detrimental to the existing growth, but also have adverse effects on its natural regeneration. It may be stated here that the factors inimical to the growth of sandal-wood in the District Forests, are (1) Spike, (2) Reckless goat-browsing, (3) Wilful injury by men, (4) Setting of the District Forests on fire by villagers in order to stimulate early vigorous growth of grass, (5) The injury caused by animals, and (6) Last but not least, the reckless hacking and destruction of sandal hosts for fuel and other uses.

Since the beginning of the century or even a few years prior to that, spike disease appeared in Mysore District and has been causing incalculable injury to the growth of sandal. The cause of this mysterious disease is yet a sealed book to both scientists, and practical foresters, though some eminent men are working at it and have described in detail only the result of its pathology. Nevertheless, the all important question of its treatment has been still an impossible barrier to get over. The department with its undermanned staff especially in high forests has not been able to do much in this direction in the District Forests, as their attention is confined to various departmental operations without which the departmental revenue would go down. In the District Forests, free grazing is allowed to the surrounding villagers. Cattle grazing is least harmful if pollarding in dry season is not resorted to. Goats are freely and recklessly admitted and the havoc caused by goat-browsing not only to every kind of forest growth but chiefly to sandal is immense and incalculable. As the District Forests are unprotected and uncared for, they are being browsed over, cut and hacked without let or hindrance.

The immense destruction caused to sandal-wood trees in these forests, both by fuel collectors and goat-browsers, can hardly be looked upon with any degree of indifference. The number of Forest offences that are

being reported annually will speak for themselves. Sandal-wood trees at every stage of growth are ruthlessly destroyed and the present unguarded state of these forests further puts a premium on the utter annihilation of this valuable tree with great impunity, especially in Mysore and Bangalore Districts, where fuel contractors cut and collect thousands of tons of fuel from District Forests, private holdings, jodi and inam lands, to the slow death of sandal by removing their hosts. The unregulated system of management of these lands, is in my humble opinion, in a great measure responsible for this unsatisfactory state of affairs.

The destruction caused to young seedlings of sandal-wood from their nascent stage to their full development by setting the District Forests on fire, is so great that the loss to the Department can hardly be estimated. Large sums of money spent by the Department year after year in dibbling sandal seeds in the District Forests will come to nothing if the unrestricted fires and the above noted drawbacks are not prevented and removed by stricter regulation and better modes of conservancy than those in forests. The villager is at liberty to set fire to the District Forests belonging to his village and thus sound the death-knell of sandal-wood in his neighbourhood. It is the interest of the ryot that he should have a vigorous growth of grass for his cattle to graze. In his self-interest he is not alive to the serious consequence which the setting of District Forests on fire would cause to sandal plants in the area. I would not be far wrong if I said that in the course of years, the sandal-wood supply would decrease if better conserving measures of District Forests and sandal hosts were not adopted and the artificial regeneration of sandal under improved methods involving liberal expenditure, are not adopted. I do not here profess to state that every one of the interminable factors which impede the growth of sandal can be combated with. However, with the stricter conservancy

of District Forests and better modes of sandal regeneration in the completely protected areas much could be done to entirely avert the artificial causes of sandal degeneration and greatly mitigate the natural dangers by adopting remedies so far known both to scientific and practical men.

Up till now, in our State there were no industries of sandal-wood worth speaking of, except that raw material was being worked and sold to foreign merchants at the annual public sales. Now we have two Sandal Oil Factories in the State. Added to this the sandal carving industry (an old handicraft of the State) is likely to revive under the ægis of our esteemed and sincerely patriotic administrator. To meet the requirements of the Sandal-wood Oil Factories of the State, and the other economic and industrial uses to which this product may be put, a larger quantity of wood than the present output will be required.

Perhaps it is known that in past years, several kinds of spurious woods known as sandal, used to be imported into Bombay from different countries of Asia, Australia, New Caledonia and other distant lands. But several of these species were rendered almost extinct by reckless destruction of trees for the sake of revenue during the first half of the last century. The result of this reckless extraction, not in any degree compensated by propagation, tending and protection of this species, has been disastrous and by reason of the absence of these inferior varieties of sandal-wood on the market, all eyes are now turned to Mysore sandal-wood and this holds its own as being the very best in quality and the richest in oil.

These facts will furnish us a complete illustration of the manner how a product which we imagine to be had in abundance may fail us in course of years, if sufficient safeguards are not adopted to conserve these trees wherever they are now growing and by stimulating both natural and artificial regeneration.

So far I have only shown that the present state of the working of District Forests does not hold out any prosperity for the sandal-wood or any tree growth; much less does it argue their recuperative power after survival from the disasters mentioned above.

The next thing that ought to engage our attention is the management of the regulated exploitation of the minor forest products in the District Forests. The chief minor forest products from which the bulk of the Forest Revenue is tapped especially in *Maidan* Forests are (1) *Thangadi* bark, (2) *Kakke* bark, (3) Gall-nuts, (4) Dye yielding stuffs, etc. With the economic development throughout the world, some of these forest products which commanded only low prices some years ago have now come into great prominence. *Thangadi* and *Kakke* barks, which as we all know, are greatly used in tanning, and have gone up very high in price and in recent years there has been a regular boom in the trade relating to these products. The District Forests are the chief sources from which this supply is tapped. Consistently with the large quantities of these barks which are being extracted year after year, very little is being done at present towards their propagation and protection, though luckily the natural regeneration of *Thangadi* both by coppicing and seeds is profuse. The chief danger that threatens this source is the expansion of cultivation of lands unfit for profitable cropping due to the low dry assessment of two annas to eight annas in *Maidan* Taluks. This danger stands nowhere when Government lessees have to overcome several difficulties arising from the non-formation of transit rules, the want of which is the chief cause which hampers the greater development of revenue not only under this head but even under II (a) and II (b) as well.

The next in importance as minor forest produce is gall-nut. Gall-nut trees are abundantly found in District Forests and

on waste lands. But this product also is not free from the onslaught of the villagers. Trees are hacked at their sweet will and pleasure and the nuts are pilfered unrestrictedly. The present world war has put a stop to the supply of synthetic dyes to a remarkable extent and the natural vegetable products yielding dyes are greatly in demand. Our forests contain many species of barks and seeds yielding valuable pigments. Most of these dye-yielding vegetable products are confined to the District Forests.

All the above mentioned products, which are chiefly met with in District Forests, are being leased out from time to time. Under the present unlicensed and uncontrolled system of management of District Forests and want of transit rules there is not much protection and encouragement afforded to Government lessees to offer better rates as otherwise they would. Large thefts of bark from Government lands leased out, usually form the subject matter of complaint by Government lessees who are oftentimes helpless in the matter. Under a stricter system of conservation the forest revenue under this source could be doubled or even trebled. With regard to the destruction caused to the timber trees of the District Forests, the less said the better. Under the pretext of removing timber or firewood for *bonafide* use under concessions now extant, a great abuse is being made of the privileges so generously conceded by Government. "Plenty breeds extravagance and dearth breeds care," holds true here as nowhere else, when one compares the waste of our ryots to the pitiable condition of ryots in the British Provinces. Some of the valuable species which now find a great economic use are felled without the least regard to the state of their growth. Both licit and illicit fellings are very rife and under the existing conditions there is hardly any chance of finding out the wrong doers and much less to book them unpatrolled and unprotected as our District Forests are.

I have so far been able to discuss rather destructively to what extent the management of the District Forests at present is exposed to various undoubted abuses and to what extent the present system of management is prejudicial to the development of the forest resources of the State and how the continuance of the state of affairs would involve the total disappearance of the forest growth of the country and jeopardise the prospects of sandal development without dilating on the consequent ill effects on the rainfall and the climatic conditions. However, I now proceed to a constructive discussion, as to what remedial measures will be necessary to avert the present state of affairs consistently with the development and organization of resources and how far these remedies could be worked out in practice without detriment to the interests of the village population and such of the community of people as have vested privileges and concessions in them.

The general impression is that the forests in India are inadequate for the needs of the country whether from a climatic or an economic point of view. This is more so with regard to Mysore. For the total area of 29,400 square miles of our State, there are in the aggregate 3,500 square miles of State Forests and reserved lands. This percentage when compared with the forest area of other Native States and the adjoining British Provinces is ridiculously low. Though we have large tracts of District Forests well-wooded in the *Malnad* and in other parts, yet owing to opposition to the afforestation of such areas, they have not been conserved. It is also true that in some places they are honey-combed with cultivation and proposals as to such areas being formed into State Forests are not agreed to. I would suggest that the management of the District Forests should be entirely vested in the Forest Department. Valuable areas containing good growth of forests may be constituted as State Forests or reserved lands for the benefit of the Government and the general

public. Such of the areas as only contain sufficient growth to meet the requirements of the surrounding population may be constituted into Village Forests under the management of the Village Committees. Wherever they are under cultivation and are not much in the midst of these valuable forests, they may be taken over by the Department by suitable assignments elsewhere or by money compensation. The object aimed at in apportioning out the area of District Forests into different categories is to delegate the management of these areas to some definite body of persons who should be directly held responsible for any misuse. By these measures it is not intended that any attempt should be made to curtail or revoke the rights and privileges that are now being exercised by villagers.

From this it does not follow that the Department should completely dissociate itself from public opinion. These suggestions may be fructified by a set of regulations to be framed in consultation with a Committee of members well-informed to deal with the question. The working of such regulations would then go a great way to put an end to unregulated and wasteful fellings and bring about conservation to the great advantage of the State both from a climatic point of view and the development of its forest resources. When once the District Forests are brought under a regulated and controlled system, the hostile factors now at work towards the denudation of the forest growth of these lands would disappear. Sandal-wood which is the mainstay of the Department and a very valuable commercial product of the world can be better propagated, protected and tended. Apart from the help afforded to its natural reproduction by a stricter conservancy of District Forests, the artificial measures that are now being adopted for the propagation of the species, *viz.*, the dibbling of sandal seeds under bushes and host plants may be improved by copying Nature and

protecting effectively by fencing the area at some cost.

There is no denying the fact that in recent years we have been paying particular attention to the continued study of sandal cultivation and we have not been slow and silent in investigations. In past years various methods of growing this plant were tried in Mysore. Nurseries of sandal plants were made in past years and plantations were made with nursery-raised seedlings. But this system proved a failure all over and the growth of sandal in many of our casurina-cum-sandal plantations is by no means satisfactory. Differences of opinion exist as regards the method of artificial propagation and future preservation of sandal. The artificial propagation of sandal in the open or in most favourable soils is generally attended with failure for want of shade in the hot season. But it is ascertained that the chances of failure in artificial sowing or dibbling in ploughed lands with the seeds of indigenous quick-growing species are few and far between.

It is not the purpose of this article to discuss the merits or demerits of one system or the other. It would be enough to say that there cannot be two opinions that with sufficient safeguards and fire-protection of the area dibbled over year after year, and the conservation of the sandal hosts therein, we could help both the natural and artificial regeneration of sandal. In addition to large areas of District Forests there are also other forest-clad areas known as *Amrit Mahal Kavals*. These *Kavals* spread over the whole State and their total area may be approximately estimated at 610 square miles. These *Kavals* are now entirely under the management of the *Amrit Mahal* Department for pasturing about 7,000 or 8,000 heads of cattle. If the number of cattle to be grazed be taken into account this is an abnormally large area, especially when the *Amrit Mahal* Department cattle have been conceded by Coorg Government to graze

4,000 heads of cattle in Hatgat and Natkeri Reserved Forests from May to August. Even with such a large area at the disposal of this Department, free-grazing in some of our State Forests is still insisted upon and allowed in certain seasons of the year. I may be allowed to observe that full use of the *Kavals* is not made, as many a *Kaval* is not visited by the Government herd for years continuously. Some of the areas of these *Kavals* contain a considerable sprinkling of sandal and several species of fuel trees. The right of exploiting forest produce in these *Kavals* is vested in the Forest Department and the dual management has not been conducive to their proper protection and conservation. These *Kavals* are not being freely indented upon by the villagers to meet their wasteful requirements and there can be no doubt that the character and composition of these areas are now greatly altered for the worse. These *Kavals* are favourably situated for the propagation of sandal and fuel species. Setting apart a suitable portion for the pasturage of *Amrit Mahal* cattle, the rest may be placed at the disposal of the Forest Department, duly alienating suitable portions fit for cultivation. This measure is eminently calculated to prevent reckless and unclassed fellings and to propagate sandal and other fuel species in an improved and systematic manner.

We are now on the eve of starting an Iron Industry in the State. The Economic Conference has given a great stimulus to the industrial development. It will not be long before several important industries will come into existence. Many of these industrial concerns which may use steam power require large quantities of firewood. It, therefore, behoves us to see that, not to speak of raising fuel plantations afresh, we protect the forest growth of these tracts. The District Forests in *Malnad* parts contain several species of timber fit for house building and minor forest industrial purposes. In *Maidan* Forests minor forest products such as

Thangadi and *Kakke* barks, Gall-nuts and Dye-yielding stuffs play an important part. Neither timber nor any forest produce in transit is governed by any specific rules. The duty of checking forest products in transit devolves upon Revenue, Forest and Police Officers. In the absence of any legislative enactment having the force of law, none of the executive orders that vary in different Districts are of any consequence. The absence of any rules for the regulation of the transit of these products from private holdings, has given rise to serious dissensions among the contractors on the one hand and the private land-holders on the other. Stealing of bark by the villagers is often reported by the Government lessees. In certain Districts, according to local usage, the removal of the bark and gall-nuts from private lands has to be accompanied by a *mafi* pass; and yet there is no legal obligation in these cases. Even in cases where *mafi* passes are obtained, the quantity to be removed from a private land is over-estimated on account of the grant of *mafi* license on the reports of irresponsible subordinates. This affords an opportunity to the private land-owner to steal the bark from Government lands leased out. Thus the interests of the Government lessees are jeopardised. When cases of illicit removal of the produce are reported, there are not sufficient means for preventing encroachment on the rights of the lessee.

It seems to me very desirable that the removal of forest products should be regulated by some systematic transit rules so that the Government lessee who has paid large sums to Government may not be helpless in the matter, and also unnecessary harassing may not be caused to the ryots. The necessary measures required in this behalf will have to be determined, as such well thought out measures have a salutary effect in developing this source of revenue. There are several other resources from

which forest revenue may be developed in the District Forests. Some of them are:—

- (1) Propagation of lac.
- (2) Bee-keeping.
- (3) Collection of fibres and flosses.
- (4) Bamboo-cane manufactured articles.
- (5) Collection of vegetable dye-stuffs and their investigation.
- (6) Collection of scented grass for distillation.
- (7) Manufacture of Catechu.
- (8) Formation of Gall-nut and Cashew-nut plantations.

The propagation of lac is now confined only to certain Districts in the State, and mostly to District Forests. A study of the systematic cultivation of this product is urgently called for. The lac insect may be propagated on different species of trees such as, *Sagada*, *Muthaga*, *Yelachi*, *Chotte*, *Jalari*, *Gobbli*, *Halivana* and others. It is needless to state that our District Forests and other deciduous forests contain a large variety of species upon which the lac may successfully be propagated. Now that there is a demand for dye-stuffs and lac is used for these purposes in addition to its forming a basis for different kinds of industrial and economic articles, it seems worth while to take up this industry in a systematic manner. There is little doubt that if this is done, it will add in a measure to the development of the forest resources of the State in the interest of local industries.

Our Ghat forests abound in canes. With these also trials and investigations would prove of some value. Cane is now largely used in connection with certain home industries in Bangalore and Mysore cities. Furniture made of rattan and other articles for domestic use find good sales everywhere. By a recent process, cane-manufactured articles could be coloured. This home industry has a bright future. The canes of our forests not having been put to test in all these industries, the produce imported from Singapore and other places is being largely used.

Many varieties of flowers, barks, fruits, rinds, pollen and woods found in our forests are largely used in the manufacture of dyes. With the commencement of the great European war aniline dyes have gone up very high in prices. Great attention is now being paid everywhere to the investigation of vegetable dye-stuffs. It behoves us therefore to carry on our investigations on the right lines in this matter also so as develop this department of industry.

Now that a Forest Research Division has been sanctioned by the Government, experiments and investigation of the economic uses of many of our forest products could very well be undertaken.

Lastly, as an accessory minor forest product I consider it advisable to try the cultivation and propagation of gall-nut and cashew-nut in our District and other forests. They seem to thrive well in dry regions and in the sandy soils and withstand draught. At the same time they happen to be fairly quick growing species. Their nuts and timbers have a great market value outside as well as locally. It is for us, therefore, to give a fair trial and form large topes in suitable localities with a view to study their growth, development and usefulness as an auxiliary species of our *Maidan* forests.

At the outset, it might be construed by some of my critics that all that I have been able to suggest regarding the future management of District Forests and development of Forest Resources might sound very well on paper—a scheme theoretically perfect but practically difficult of application. I would only say in reply that nothing could be more indefensible to one's mind than to imagine impracticabilities at the very threshold. I am sanguine that in the nature of things, the idea of curtailing or restricting the unrestricted rights and privileges now conceded to villagers will not be acceptable to them, and such proceedings will bring with them a certain amount of odium. When the interests at stake are considered, I believe

that some sacrifice ought to be made. Unlike in other provinces, large areas of District Forests are allowed to the ryots in Mysore. They are in excess of their actual requirements. As has been expressed by the Shimoga District Committee, the extent of *gomal* land now assigned in the *Malnad* tracts is generally very large and in excess of actual needs. It is thus clear that the concession of free grazing or any other privileges either in District or State Forests need be considered only in cases where the requirements for communal purposes, after the formation of the forests, are found insufficient. It may be, I grant, that this is hardly the case anywhere in Mysore. The regulation and management of District Forests subject to the exercise of such rights and privileges as are actually needed by the rural population will not seem, in my humble opinion, to cause any inconvenience or hardship. The whole question, therefore, is not so much a question of restrictions and curtailing the privileges of the ryot as of placing the District Forest management on a better footing. Even with regard to several sources of development, a systematic study of the various factors contributing to the success of the proposals should be undertaken in right earnest and the practicability of the scheme ascertained. I consider that it is only by adopting a course of remedial action, wisely determined, sympathetically undertaken, and steadily and persistently adhered to, in spite of some temporary failures and discouragements, that we can solve this problem.

According to *Capital* a new American paper-bottle machine, operated by three men, makes 5,000 sanitary milk containers an hour, each bottle being finished from raw pulp in about eight minutes. One ton of pulp suffices for 60,000 bottles. The bottle is made impervious to liquids in a bath of paraffin.

THE ECONOMIC VALUE OF CALOTROPIS GIGANTEA.

BY MR. P. PADMANABHA IYER, B.A.

IN nature, the existence of a thing shows the necessity for it, but perverse man thinks otherwise. The abundance of a particular thing decreases its value and utility in the eyes of man; otherwise, it is not possible to account for the fact that while cocoanut-fibre, alœ-fibre and other such kinds of fibre are in the market, the fibre of the humble *Erukkam* (*Calotropis Gigantea*,) is not at all known. It gives (from its bark) decidedly the strongest fibre obtainable from any plant in South India and it has also great value as a textile. While cocoanut-fibre breaks under three-hundred pounds, and alœ-fibre under three-hundred and fifty pounds, the same weight of the fibre of *Erukkam* breaks only under four-hundred and fifty pounds.

Erukkam is one of the commonest shrubs of India and grows in all kinds of soil. It is called in Tamil, *Erukkam*; in Kannada, *Erukkam*; in Telugu, *Jilledu*. No special care is needed to cultivate it as Nature has provided the seeds of this plant with wings, by which they are blown about by the wind, thus saving the cultivator the trouble of collecting the seeds to sow them in other places. It is the wings on the seeds which have aided the dispersal of the plant and prevented them from growing thick in one place and thus prove their own destruction. To grow this plant no tilling, manuring, or even watering is required. It keeps fresh and vigorous even in the driest weather. It does not grow to any great height, nor is it thorny.

The plant abounds in milky juice. The milk of the *Erukkam* is largely used by native physicians. Cow's milk, the milk of *Erukkam* and a little salt is recommended

by native physicians for tooth-ache. The plant is erect and smooth, with opposite entire leaves and interpetiolar (not axillary, but from between the petioles on one side of the stem) umbels of pretty rose and purple flowers.

The *Erukkam* fruit is about three to four inches long and two inches broad. The follicle is concavo-convex. It bursts open when ripe and dry and ejects the seeds. The seeds are each about half-an-inch long, and are covered with silky hair which enables them to fly and get dispersed.

The plant belongs to the natural order called *Asclepiadaceæ*. This family is of peculiar botanical interest on account of the remarkable structures of the essential organs of the flower. Cross-fertilisation in this plant is exceedingly interesting, and the insects which help the fertilisation of the ovaries are caught in the structure, called *Corona*, in the flower, and are there for at least two or three days till they fade away.

The process of getting the fibre from the plant is not difficult. Only the bark has to be peeled away. The bark is full of fibre and no further labour is required than tearing it. Professor Oliver is of opinion that the fibre is very valuable for textile purposes, and that it can be put to the same use as flax or hemp.

India contains large tracts of waste land on which *Calotropis Gigantea* can conveniently be grown. If any country affords facilities for growing this plant, it is India. It requires no outlay and it will bring in a large profit. As far as I can see, it gives the strongest fibre. While other fibres cannot stand soaking in water for a considerable length of time, the *Erukkam* fibre defies all efforts of water to rot it through soaking. There is a happy and harmonious combination of cheapness, strength and durability in this plant-fibre and it is really surprising that no one has yet tried to put it on the market and show its real worth and usefulness.

THE HOUSING PROBLEM IN MYSORE CITY.

BY MR. G. R. RAJU.

NOW-A-DAYS, in Mysore, the Angel of Progress seems to fly on a fleet Pegasus, leaving behind her a train of grim, protean and reactionary "costs." The marvellous celerity with which the manifold civic embellishments came into being in a few years, the refined ideas of public health and the rapidity with which lands and private house property were acquired either for public purposes or for sanitary improvements, have given rise to a new problem of no small importance. The inadequate money-compensation given by the Municipality in some cases, the market conditions which set a premium on housing materials and a legion of local conditions, such as heavy encumbrances on some of the houses dismantled—all these made the construction of new houses slow and difficult. And this lessening in the number of houses of the lower-middle and the poorer classes soon resulted in overcrowding and high rents.

The City Improvement Trust, came to the rescue and began last year, the construction of "model houses" ranging from Rs. 800 to Rs. 1,800 in value, through the agency of Building Contractors, ('men of straw' as Mr. Dawson calls them) and sold these houses to people on a cash-sale basis. The Trust has proposed this year, to build fifty-six houses of different specifications at a cost of Rs. 30,429 and the City Municipality is also contemplating a scheme of constructing thirty houses in Idga and Chamundi Extensions.

Now let us consider certain essential canons of housing in the case of the poorer classes, and see how far the scheme of "model houses" does conform to them. First, there

must be comparative ease with which the facilities offered either by the State or any housing agency to people of small resources could be taken advantage of. Secondly, a standardisation of value of these houses should be fixed, so as to make the rent of these houses normal and moderate and the house speculator's operations unproductive. Thirdly, the idea of "projected efficiency" or calculation of the future and not the bare "ascendancy of the present" should dominate the policy of the housing agency to ensure permanency and stability of results.

Does the scheme of "model houses" satisfy these canons? Is there any worthy recompense for the good intentions and the consequent sacrifices of a paternal Government? Has any permanency of results been assured for what it has inaugurated? It is hard to answer these questions in the affirmative. If men of limited resources wish to buy these houses, they cannot satisfy the commercial basis of sale—the handing down of hard cash in one lump sum. It is also unprofitable for these people to buy these houses, through the agency of a Bank (even if a Bank is prepared to give a long-term loan for twenty and thirty years) due to the cost of these houses and the fairly high rate of interest charged by the Bank. Thus our first canon of housing breaks down. And under the ruling conditions, these model houses are bought by people who are in need of a profitable investment in the expectation of realising a high rent or re-selling them after a time at a premium. This creates a kind of monopoly which in the hands of a class of people, cannot keep down rent and house values. And the increase of rent and fluctuation in house values of the lower-middle and poorer classes, which set at naught the idea of "projected efficiency," will keep the housing problem evergreen, while the growing urbanisation of the city, the need for further sanitary improvements

and a beatific vision of a transparent future of the city in industrial and economic prosperity, will make it perennial. So, the "model houses," as they stand, are nothing more than a taxable asset to the Municipality and a fine instrument in the landlord's hand to screw increasing rent from tenants. A remarkable instance of the failure of this system of building houses is that of Leipzig (in Germany) where the people refrained from building houses because of "the unprincipled speculation and pernicious gambling of land companies."

Having regard to local conditions perhaps, a system of housing, in the light of the following suggestions, would be of advantage to the people of small means:—

1. HOUSE SITES.

(a) *Extensions*.—More extensions round the City, e.g., near the Jewell Filter Bed, should be laid out and building sites should be allotted to people, on the easy payment system, which is now in vogue in the City Municipality. The land lease system should also be adopted to a certain extent. This is intended for people of moderate means, who generally find the payment of both the land and house-building loans at the same time, a trying affair. Priority of payment should be insisted on in the case of the building loan, which is necessarily greater in amount. Until this loan is liquidated, the land must be leased out for a small amount payable in monthly instalments.

(b) *Opening of Suburbs*.—The extension of City boundaries by the incorporation of rural suburbs and thus bringing in new areas for building purposes and of diversion of population outward and planning of these areas on systematic lines. This is likely to alleviate the peculiar difficulties of the housing problem to a great extent. On this, we have had a comfortable assurance from the Government recently that they are contemplating the opening of suburbs in

Mysore and Bangalore. But mere opening of suburbs is not enough. These should be connected to the metropolis by easy and cheap land traction, e.g., Electric Tramways with the sectional or "zone" system in rates ranging from three pies to one anna or so.

(c) *Land Assessment*.—The system of levying a higher tax on agricultural land when used for building purposes should be abolished and the periodic assessment of land should not be made applicable to building land.¹

(d) *Land Municipalisation*.—All the vacant sites and others suitable for building purposes in the City, which are now under private ownership, should be municipalised. This would tend to check the undue rise in the price of land and ultimately eliminate the factor of fluctuation. There is nothing novel in this procedure. German Municipal experience on this head is likely to prove useful to those interested in the matter.

2. FINANCIAL AID.

The effective solution of the housing problem depends much on the financial help given by the State to

(a) the City Municipality, at a low rate of interest for a long term of twenty or thirty years. This capital should be lent to individuals on a progressive rate of interest, ranging from 3 to 5 per cent on the basis of the amount borrowed. This system will afford facilities to borrowers of different earning power and ability to pay.

(b) *The City Co-operative Housing Society*.—The State should finance the Society at a low rate of interest. Loans from the Provincial Co-operative Bank at $7\frac{1}{2}$ per cent per annum cannot prove helpful to the Society and its members. There is, in societies of this kind, plenty of room for

our philanthropists to invest their idle capital at a low rate of interest. The wealthy Mutts and Devasthanams could vindicate their unseen mystic capacity, at least in giving a worldly salvation to some of their needy votaries, lending their gold at nominal rates of interest.

3. EXEMPTION FROM TAXATION.

Some of the houses in the Extensions below a certain value, should be fully or partially exempted from municipal taxes for a time to enable the owners of houses to pay with little difficulty their monthly stipulations in clearing up the house-building loans. To make up this deficit the Municipality could take "betterment taxes" in certain localities, which enjoy better amenities from that body or levy differential rates on houses of higher rental value. These sources are yet, perhaps, wholly untapped.

4. MUNICIPAL HOUSE REGISTRY.

The Municipality should open a House Registry Office where it should register "offers" and "wants" of houses of a certain value and information required about them should be given on a small payment. This system is likely to save much useless wandering and loss of time on the part of house-seekers. It is also likely incidentally to bring to the notice of the Municipality every rise in the rents of houses, which could then be easily checked. Some parasites, who live by rack-renting and who have no legitimate place in social economy, would thus be eliminated.

5. FACILITIES TO STATE EMPLOYEES.

It is true that clerks, etc., in Government employ are now shown some concessions in the matter of house-building advances. But the interest on borrowed capital which has been recently lowered from 10 to 6 per cent is still a little too much. The interest must be lowered still further and the progressive system on the basis of the amount borrowed should be adopted. In Germany and other Western countries, Government

1. Rao Bahadur S. S. Talmaki suggests this in the *Local Self-Government Gazette*, November, 1916.

employees enjoy greater facilities and privileges, e.g., loans, up to £ 75 are granted to them free of interest and at 3½ and 4 per cent beyond that.¹

6. RIGHT OF RE-PURCHASE.

This right undoubtedly ensures the permanency of the results of a sound housing policy. The Municipality should reserve the right of re-purchase to itself when the owner of a house makes default in the observance of any of the stipulated conditions,² with a certain period, say of one hundred years.

(1) In case the owner of a dwelling house in spite of a written warning, lets it at rates in excess of the reasonable amount fixed by the Municipal Executive.

(2) In case the owner takes a further mortgage on the property, without the consent of the Municipal Executive.

(3) In case the owner sells the house for a greater amount, which is in appreciable excess of the original cost, plus that of permanent improvements done to the building.

In cases of this nature the house might be sold to others, who are willing to be bound by rules of the Municipal Executive, on the express condition that the sale price should not exceed the gross output at the time of sale. The individual sacrifice (if there is really any sacrifice) counts for little, when the social good of a particular community of ordinary status in life, is ensured.

In Germany, the City of Ulm, has struck a new path, which possibly could be experimented in Mysore. The City has built 175 houses with 291 flats for 1,367 inhabitants on the following conditions:—The City builds

the houses and the purchaser pays the net price 10 per cent down and the rest in instalments with an interest of 3 per cent per annum. In order to secure for the future low prices for the houses and low renting, the City is authorised within one hundred years to take back the houses at the original purchase price; plus the cost of improvements.¹

The housing problem in this State must be worked on thoroughly practical lines, on lines which will satisfy the real needs of the people, keep down rents and ensure permanent results. Bad housing—defective both in quality and quantity—means much loss to the community. Well may we exclaim with Ruskin “What is the glory of our architecture, if the poor must hide in dens and holes? What is our boast of greatness and strength, if the weakest are not cared for? What is our pride in mental achievement, if the thought of the people tolerates filth and degradation?”

1. Frank Koester's *Modern City Planning and Maintenance*.

From 1913, in India State aid to industries has been granted till now to 75 firms and individuals (48 European and 27 Indian) and of these 28 firms and individuals have been granted loans (16 European and 12 Indian), the largest single loan being Rs. 7 lakhs at 5 per cent per annum to the central sugar factory at Gorakhpur (European) and Rs. 20,000 to Mr. Ishwar Dass Varshnie of Moradabad (U. P.) for a glass factory at Bajhoi. A statement of the concessions in freight rates granted by railways to firms and individuals for the transport of raw materials and finished products, leaves the impression that the benevolent intentions of the Government are not as widely known by Indians as by Europeans and therefore applications from Indians for concessions have been fewer than from Europeans.

1. Dr. Arthur Shadwell's *Industrial Efficiency*, chapter on “Housing.”

2. These are some of the conditions which the Municipalities of Jena, Mannheim, etc., impose on the owners of their buildings. W. H. Dawson.—See *Municipal Life and Government in Germany* P. 484.

ECONOMICS IN THE WEST.

The Coming Changes.

London, November 8, 1917.—These notes are not concerned with the political issues which at the present time are under discussion in India and I do not propose to break a wholesome rule by intervening in the controversy. But it is permissible, I think, to draw attention to the feeling that exists in influential quarters here that the coming changes if not carefully made may tend to mar the harmonious co-operation which has so long existed between Briton and Indian in the economic sphere. The fears are probably exaggerated, as there is no substantial reason why political development should not proceed without affecting unduly conditions in the great field of commercial and economic enterprise which properly lies outside its operations. The view, however, of some is that the pace may be unduly forced by the politicians and that a state of unrest and uncertainty may be created which will frighten capital—now more than ever a timid bird—and that it will take flight from India to the grievous detriment of her trade and industry. The point is certainly one which cannot be ignored in appraising the value of particular schemes for the future Government of India. It would not be progress but the reverse if as a result of hasty and ill considered action India were deprived of the fructifying stream of European capital which it has hitherto enjoyed. For she would lose not only the financial means of utilising her resources to the best advantage but would be deprived besides of the invaluable stimulus to self-development which the European directed agencies within her limits supply. Recall for a moment what India owes to outside enterprise. Tea, coffee, and jute—to name three staple Indian commodities—are all produced as the result of European financial activity and enterprise

at a period when India had neither the experience nor the capital herself to create such industries. The great cotton manufacturing industry of Bombay was founded by Europeans and it is by observing the sound principles taught by the pioneers from the West that the Indian millowners of the Western city have gained their present prosperity. In like fashion new industries have been set up all over India which are invaluable models and exemplars for Indians who are intent on the economic development of their country. Then there are the railways which are one of the most splendid assets of the India of to-day. If far-seeing British capitalists had not realised the possibilities of India for railway development at a time when the Indian mind was apathetic on the subject of rapid and easy transport the superb system which now exists would not have come into being or at least would have been delayed for a generation. On the whole the partnership of British and Indian in the economic development of India has so markedly justified itself by results that I cannot conceive any patriotic Indian desiring to adopt a course which may tend to dissolve it.

USE OF COAL GAS.

India is not a great gas producing country but with her extensive coal fields there is no reason why she should not some day become one. For this reason I should like to draw attention in these notes to the remarkable development that is proceeding here in gas driven motars. It has arisen out of the petrol shortage which has compelled inventors to go outside the ordinary sphere for the motive power for self-propelled vehicles. Coal gas did not at the outset appear to be a very promising agency for the purpose, but experiments have shown its real utility and such progress has been made that it may be confidently said that the gas driven motar has a distinct future. A few days since an exhibition of motar vehicles of every class run on gas was held here and

attracted much attention. Some remarks made by the newly appointed Petroleum Economy Officer of the Petroleum Executive give a good idea of the degree of success that has been attained with the new agency. This functionary in his speech made it clear that the use of coal gas in motars is not a war time expedient but marks a development "of lasting economic importance, in that when materials and labour become available to permit the general use of gas under compression, the limitations which are at present imposed by its use on vehicles from flexible holders at practically atmospheric pressure—limitations of space and radius of action—will be overcome. Town gas can then be utilised to full advantage especially having regard to reduction in the accepted weights of cylinders, due largely to the employment of high tensile steel instead of mild steel, all high tensile steel being now required for aeroplane and munition manufacture." At a further point in his remarks Mr. Shrapnell-Smith, the officer indicated, limited that owing to the fact that the use of gas represents such an appreciable saving over petrol it was very likely that gas used in motars would after the war be subjected to a special tax in the interests of the revenue which is ear-marked for the upkeep of the roads. In this suggestion we have a fair indication of the extraordinary value of the new system. It may not revolutionise motar propulsion—cut out petrol—but it will in all likelihood vitally change the existing methods. Already the inventors are showing that in spite of the restrictions on the use of steel for cylinders gas propulsion on a large scale is possible. A gas "bolster" constructed of the materials customarily used in the production of tyres has been designed for service with vehicles run by high pressure gas. This container, which weighs 60 lbs, may be fitted on the running board of any car and holds enough gas compressed to 1,800 lbs per square inch to carry the car the same distance as two

gallons of petrol. Preparations are being made for the placing on the market of these containers and it is anticipated that later examples will not only be lighter and smaller but will even carry more gas. In this way as in many others the war is producing inventions of high utility which will help us in the difficult days that lie ahead when economy will be the indispensable rule of life.

That it is not alone in regard to motar propulsion that coal gas is destined to play an important part in the future, is shown by the report of the Fuel Research Board of the Department of Scientific and Industrial Research which has just been issued. The document is much too long to be dealt with except in a boldly summarised form but it is so intensely interesting as a sign of the drift of scientific thought in these strenuous times that all who wish to keep abreast of the developments of applied science should secure a copy and read it. Generally speaking the Committee have had before them problems of carbonization and gassification in connection with the coal supplies of the country. Their inquiries have been prompted by demands for cheaper and more ample supplies of electrical energy, for home supplies of fuel oil for the navy and of motar spirit for the transport and air services and for smokeless domestic fuel. The report states that the only development that would satisfy all these needs simultaneously would be the replacement of a large proportion of the raw coal which is at present burned in boilers, furnaces and domestic fires, by manufactured fuels prepared from raw coal by submitting it to distillation. A certain amount of knowledge and experience is in the possession of experts who, the Committee think, might be able with its aid to organize and direct schemes for replacing raw coal by manufactured fuel in certain directions, but no really comprehensive scheme is possible until certain perfectly definite problems in coal distillation have

been solved. They proceed to discuss these problems and as a result of their survey tabulate a series of questions which embody the leading points to be considered. These include the following: "Can the thirty-five to forty million tons of raw coal used every year for domestic heating be replaced wholly or partially by smokeless fuel, solid or gaseous, prepared by the carbonization of the coal"? "Can adequate supplies of fuel oil for the navy be obtained by carbonizing the coal at present used in its raw form for industrial and domestic purposes?" "Can electric power be obtained more cheaply if the coal used for steam raising is first subjected to processes of carbonization?" Answers to these and the other questions formulated, the Committee state, will be obtained only by co-ordinated research carried out on the lines of a broad and well considered scheme and they suggest the erection of a research station for the definite consideration of the problems involved in the inquiry. Meanwhile it is pointed out that even if an efficient method of low temperature carbonization is evolved it will be valueless in the wider sense unless profitable outlets for all the important products can be developed. In this connection reference is made to the anxiety evinced by the admiralty to secure adequate supplies of fuel oil from home sources and the statement is made that their requirements alone would absorb all the oil which could be produced by the carbonization of tens of millions of tons per annum. On the average it may be taken that each ton of coal carbonized will give fifteen cwt. of coke; hence from the twenty million tons of coal which would have to be carbonized in order to obtain one million tons of fuel oil for the navy fifteen million tons of coke would be produced.

INDIA'S DEEP INTEREST.

At the first blush it does not appear that India is very deeply interested in the problems which the Coal Research Committee are dealing with. But if we go a little

deeper into the question we shall realise that it has for her an importance as it has for every country which possesses any degree of coal wealth. For what does the investigation imply if it proceeds to its logical conclusion? Nothing short of a complete revolution in the handling of coal and a striking if less partial transformation in industrial methods. Raw coal in many cases will become too precious to be burned in ordinary furnaces for ordinary purposes. It will be treated at the pits mouth, the valuable by-products eliminated and the residual fuel—the coke—sent on to the market to replace the original commodity. India should be able to accommodate itself to this revolution when it comes without difficulty. Coke, in parts of Bengal and Northern India has already become an acceptable domestic fuel and it will only need the fillip which the new system will give to extend its use throughout the country to the advantage of the inhabitants who will have a splendid heat producing agency for cooking at small cost. Industries in the coal region will also profit by the cheapening of fuel which will result from the sale of valuable by-products hitherto lost to a large extent.

THE STEEL TRADE.

The stimulating influence of the war is illustrated, again, in the sphere of the steel trade which has profited enormously by the incessant and colossal demands made upon it for supplies for war purposes. An interesting article on this subject appears in the current issue of the Commercial Supplement of *The Times*. It is there stated that our steel output which at the outbreak of the war was only at the rate of 7,000,000 tons a year now exceeds a rate of 10,000,000 tons and will shortly reach a 12,000,000 tons level. The writer goes on to say that it is hardly possible to exaggerate the improvements that have been effected in spite of the enlistment of so many skilled workers. "Old works have been refitted, new ones

built up by the hundred acres, skilled workers have speeded up, vast numbers of unskilled have become efficient and our manufacturers are learning to co-operate for increased and economical production, whilst far reaching methods are being planned and adopted for obtaining more trade abroad when the abnormal demand for munitions ceases." We are further told of the extensive use of electricity in steel making and of plans being formulated at Sheffield for a gigantic extension of the existing power plants. Another interesting development of the steel trade activities of the war period is the production of rustless steel. "This was a wonderful and almost accidental discovery made before the war broke out. The steel was first used in the manufacture of certain parts of air craft. But shortly after the outbreak of the war it began to be used by the cutlery makers. This steel has stood every possible test. Knife blades made of this material will keep their original brightness under every condition." So it will be seen that there are silver linings in this terrible cloud of war. When we start the world again after the conclusion of peace British Industry will be infinitely better equipped than she has ever been in the whole course of her existence.

ARNOLD WRIGHT.

"Necessity is the mother of invention," as it is proved by the incessant research work of the Germans for the discovery of substitutes for metals and other materials of which they are in great need. The attempts to produce aluminium from clay, according to the *Neue Zurcher Zeitung*, have been crowned with success, and will make Germany independent of foreign supplies of bauxite in the future, which latter is, however, also available in Hungary.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Rejuvenating Scrap Heaps.

Washington, D. C., U. S. A., November 10, 1917.—It is not so long ago that United States plant managers, superintendents and owners regarded anything thrown into the scrap heap as lost beyond reclamation. Two things have contributed more than anything else to change their opinions of waste. War has given the impetus, modern welding processes have furnished the means.

With prices of war materials pushed to dizzy heights the American factory man has begun to analyze his scrap heap. Usually he finds huge accumulations of damaged or worn machinery, tools, short ends and what-not. Face to face with labor shortage, metal shortage, and the time factor, plant-owners are calling upon the welders to reclaim these worn and damaged machines and broken tools and put them back to work earning profits. Of the many instances of this sort of thing which might be gathered I will mention a few.

Recently, an engineer for an oxy-acetylene concern made an investigation in a western field. At one big mine he found in the scrap pile dies for drill sharpening worth nine dollars each which could be welded and put into service at a cost of one dollar each. From a year's accumulation of scrap enough of these were dug out to furnish a three-months' supply of dies, at a time when the mine owners were very dubious as to the possibility of securing new ones.

In another place this engineer found a year's supply of tram buckets with broken bottoms. These, worth forty dollars each, were welded at insignificant cost. In the same scrap heap he unearthed a three-months' supply of stamp stems, and enough short ends of tungsten steel to last a year when welded together. Crusher plates of

manganese steel, worth twenty dollars each, had been scrapped because they were slightly too big for a new installation of machines; and these were cut down by the oxy-acetylene process and restored to use at an enormous saving.

A big milling concern rummaged its scrap heap and found a lot of gear wheels which had been discarded because teeth were broken out. At a trifling cost new teeth were fused into the castings, making them as good as new.

A railroad company had a big accumulation of scrapped driving wheels for locomotives, most of which had cracked spokes. A saving of thousands of dollars resulted from the use of the welding process on these, without mentioning the increased train movement made possible by restoration of discarded engines to service.

On another road a locomotive was towed into the shop with a badly damaged cylinder. The first diagnosis made the case out as hopeless so far as repair was concerned. But acute shortage of rolling stock led to a rehearing, the welder was called in and at a cost of twenty dollars made the \$750 cylinder as good as new.

A paper company was badly in need of metal cores for winding rolls of paper. Tube mills were far behind in their orders, and there was slim chance of getting any action in that direction. But out of a three-years' accumulation of broken and defective cores the welder reclaimed three carloads of good tubes by the simple process of cutting them into short perfect lengths and welding these together.

Still another railroad was on the point of tying up several hundred locomotives because of the impossibility of renewing defective boiler tubes. Digging into a five-years' accumulation of junked tubes, however, brought forth more than enough salvageable pieces to put all the dead engines into commission. Here is another case where the

direct saving does not begin to indicate the value of the reclamation work effected.

High speed steel is growing so scarce that many concerns are meeting their urgent needs by using the oxy-acetylene torch to weld short ends together into pieces large enough to be used again in tool making. This process has become so general in this country as to require but little illustration; but a rather interesting development of the idea involved is seen in the case of one electro-plating plant which has begun to weld the stub ends of nickel anodes. These were formerly sold at a junk price to get rid of them; but now, by an expedient quite similar to that of sticking a small piece of soap, left from the old bar, upon the new, they are used up with 100 per cent efficiency.

One of our leading automobile makers has turned the welding process to good account in reducing the loss from defective castings. Many of these, rejected through minor disabilities, can be fixed by the welder—slight holes filled, thin spots built up—at a much lower cost than that of melting and recasting. This idea is surely one for general application everywhere and in all countries.

One concern manufacturing chain belts was handicapped in delivering a rush order because a careless workman, in roughing out some large links, took off too much metal. The oxy-acetylene process was called into play to build up these pieces again, and the work was accomplished in a few hours, so that the order was delivered in time.

It will be seen from all these examples that saving hundreds of thousands of dollars every year through careful analysis of the scrap heap and castings returned for remelting is not a theory, but an actual fact being demonstrated all over the country. Under the hands of the oxy-acetylene welder it seems that metal almost takes on the character of the putty with which the sculptor does his preliminary work, and which can be shaved off and built up, joined and molded

and worked in any desired fashion and as many times as may be desired.

Nor is this process necessarily restricted to any one or several metals, as some might suppose. Any kind of metal at all is amenable to the oxy-acetylene treatment—steel, cast or wrought or sheet iron, brass, copper, bronze, aluminum, nickel, even gold, silver and platinum—all these can be cut or welded at pleasure. At the heat of 6,300 degrees Fahrenheit produced by the combustion of acetylene in oxygen every one of these metals fuses and runs together, acquiring in truth a consistency even softer than that of the sculptors' putty to which I have compared them.

America is said to have the biggest scrap heap in the world; but as conservation is the scrap heap's worst enemy, it is expected to be greatly reduced before the war is over. Perhaps by that time the nation will have learned thoroughly the lesson of how to convert scrap metal of all kinds into gold and silver dollars.

MEASURING DAYLIGHT.

The United States weather bureau publishes daily figures giving the percentage of sunshine, and these have been used by illuminating companies in compiling statistics on the generation of power. But the weather bureau recorder is so set up that it will record whenever the sun's disk can be made out through the cloud film; hence what it really gives is a sunshine record, and not at all a daylight record. On many days when there is no need for artificial light it shows a sunshine percentage of practically zero. For this reason there has been a demand for an instrument which would record the true percentage of daylight.

The obvious line of attack here is to construct a receiver using the selenium cell, whose resistance varies with the light. But in a series of experiments carried out at the instigation of a Boston illuminating company it was found that this material was not entirely satisfactory, and a substitute was

sought. Wholly by accident—to be precise, through failure of an experiment when repeated in different light from that under which it had originally been performed—it was discovered that tungsten possesses the property which has always been thought peculiar to selenium.

The first receiver made for the daylight recorder accordingly consisted of a group of 40-watt tungsten lamps, mounted on a board and located on the roof so as to receive light from the north sky only. The day on which this was first put into operation was partly cloudy. About the middle of the afternoon, however, the clouds disappeared, leaving a perfectly clear sky. To the investigator's amazement, the recording pen, instead of rising to greater heights, promptly fell, disclosing the fact that the light received from the clear sky was considerably less than obtained by reflection from clouds. It was accordingly decided to invert the receiver and place beneath it a white reflector designed to deflect to it the radiation from the entire sky; and with certain modifications made necessary by the artificial character of the city atmosphere, this arrangement was permanent.

The albedograph, as it has been named, has been in operation for six months with good results. The lamps whose variations in resistance starts the chain of events which leads to the recording of the daylight percentage are arranged in series with multiple grouping, so as to afford maximum sensitiveness with minimum current through each lamp.

RAPID GROWTH OF DYE MAKING.

It is probable that there will be fewer bright colors worn this winter and next spring than for many years because of the scarcity of dyes due to the war, but it will be only a short time until American ingenuity has met the demand. As a matter of fact, the demands are practically all met now. The greatest difficulty the dye makers have had to overcome is that of making fast colors. Since the war began American chemists have been experimenting with all sorts of colors, but it has been hard to make the American dyes stick.

Gradually we have been overcoming the defects. From five small concerns making

aniline dyes in this country and a few crude and intermediate dyes, the dye-stuffs industry has grown to close to 250 concerns of both types since the war started, and the number is rapidly increasing. The recent exposition of chemical industries in New York showed that the United States has grown from an inconsiderable factor in the dye making of the world to one of the leading producers. The industry is now well established here, and never again, it is predicted by those well informed in the development of the industry, will the people of the United States have to depend upon any other country or countries for dyes of any kind. Only certain very rare shades, for which there is so little call that they cannot be profitably made, are not being manufactured, and should the demand for these increase sufficiently they can easily be produced. Who would have predicted a year ago that the point would so soon be reached where this country would be exporting dyes? But such is the case, and we are selling dyes in great variety not only to Latin-American countries, but to England and France.

A full line of direct colors is now being made in the United States, including fundamental blacks, blues, browns, yellows, oranges and violets for the textile industry, but it will not be possible to produce manufactured colored cloth in quantities sufficient to supply the demand this winter, and for next spring. Consequently, the fabrics on the market will be mostly in the more sedate colors, which, after all, perhaps, is not a bad idea.

GLASS FOR COOKING UTENSILS.

From time immemorial cooking utensils have been made of pottery, because this was the only substance known that would withstand the heat of the baking oven and the rather rough handling of the kitchen, and that was, in addition, cheap. Almost the same ingredients are used in making pottery as are used in making glass. In pottery these ingredients are molded into forms and are simply baked at a temperature just high enough to melt a glaze on the outside surface; but in glass they are melted into a liquid at a high temperature and then molded by pouring or blowing into various shapes.

The common glass that we have always known is brittle, easily breakable, and never before has there been a glass produced that

could be heated and suddenly cooled without breaking. But a new glass now being made at Corning, New York, is used for baking dishes and cooking utensils and can be handled quite as roughly as any crockery. Every housekeeper now can see what her puddings and pies look like on the inside. This glass is a chemical product, in that it has been produced solely by the ingenuity and patient experimentation of the chemist in the compounding of the ingredients, and not by any method of tempering.

MAKING PAPER TAPES.

Few who use adding machines, cash registers, wrapping machines, rolls of paper tape for sealing packages, or any of the thousand and one other devices which demand an accurately cut and wound roll of paper, of narrow width, ever stop to reflect upon the method of making such rolls. A moment's thought, however, will make it clear that the trick must be accomplished by cutting a wide roll into narrower sections; for the handling in unrolled form of any such shape as that of a ticker tape or a cash register roll, for instance, would clearly be quite out of the question.

Until a very recent date the process of making these rolls was of but little importance to the paper manufacturer: the bulk of the product of a mill was shipped out in sheet form, and for such paper as had to be put up in rolls any method at all was good enough. But with the enormously increased, and still increasing, consumption of this sort of article, the requirements for accurate and clean cut strips of every conceivable width have been such that the processes of manufacturing these rolls call for more and more of the paper maker's attention. The result has been the development of a series of slitting and rewinding machines which operate upon the general principle of unwinding a broad roll from one roller and rewinding it on another, cutting it continuously and automatically into a number of narrow widths as it passes some point between the two rollers. In these machines the slitting and rewinding processes cannot be regarded as separate and distinct from each other. Each process is supplemented by the other and both work in harmony.

ALFRED T. MARKS.

NOTES.

Sawdust is generally considered a waste product. At present its principal uses, especially in Europe and the East, are for spreading on floors of cafés, cabarets, shops, etc., on wet or muddy days; also for fuel (when briquetted), any for stuffing dolls; whilst in Germany, if recent reports are correct, the humble sawdust is raised at the present time to a higher plane of utility by being used as one of the principal ingredients in the "manufacture" of war-bread! Its adequacy, however, in the latter form is very doubtful. But, whether as a medium for the protection of shop-floors, or as a convenient substance for stuffing dolls or Germans, sawdust is wastefully used. Yet, as in many other so-called waste products, there is wealth in it; for, besides a variety of by-products that can be obtained by chemical treatment from sawdust, an efficient motive power can also be obtained from it by its use as fuel in suction gas-producers. Its utilisation for such purpose will relieve the situation, especially in places where the use of suction gas-plants is very extensive and the difficulty in obtaining the necessary anthracite is much greater than here. It is satisfactory, therefore, to note that with the same object in view a correspondent has recently suggested that there should be brought to the notice of all users of suction gas-plants the value of sawdust and shavings; and that their gas engines will work equally as well on sawdust as coal or anthracite, and that three tons of sawdust will give the same result as one ton of anthracite. For the conversion of sawdust into gas, the plant is slightly larger than for coal, and with the addition of a tar extractor the principle is the same. The possibility of the use of this waste is not generally known, consequently the volume of sawdust destroyed and wasted is serious. If British

manufacturers of suction gas-plants would let buyers and users in the East know that they can supply such plants for the conversion of sawdust, wood refuse, etc., into gas, the results would persuade them that there are great opportunities for them at the present moment in those markets.

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Within the past year or two the situation in Japan in regard to the paper and pulp industry has become extremely interesting. The great advance in the price of foreign pulp, and the difficulty of obtaining supplies, owing to the war, have stimulated a desire, which is always present amongst the Japanese people as regards their industries, to render this particular industry independent of imported raw material. Extensions of paper and pulp mills have been the result, although it is mainly in the latter branch that extensions have been made. Both in the Hokkaido and Japanese Saghalien, where supplies of timber are abundant, several new mills have been erected and others are projected. A large Japanese paper company has decided to erect a pulp mill at New Wiju (Shingishu), on the Yalu River in North Corea, drawing timber from the extensive forest area in that vicinity, and, in addition, is erecting two mills, one in Saghalien and one at Asahigwa in the Hokkaido. In this connection the following particulars, taken from the Report for 1916 of the Yokohama and in Tokio Foreign Board of Trade (*i.e.*, Chamber of Commerce), may be of interest:—Imports of paper into Japan in 1916 amounted to 36,777,000 lb., as compared with 28,209,000 lb. in the previous year, while the domestic production of paper rose from 367,578,871 lb. in 1915 to 405,468,781 lb. last year. Imports of pulp in 1916 amounted to 57,263 tons, as compared with 53,261 tons in 1915 and 44,983 tons in 1914. The Report states that the three plants which are being installed in Saghalien, and which are expected to be in operation by the end of the present

year, will produce at the rate of 80,000 tons of pulp per annum. Eventually, it is thought, if these plants, and the projected plant in the Hokkaido, are successful, Japan will become independent of foreign supplies.

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The question of the utilisation of the sun-power in Egypt has again arisen, and new tests are being suggested. The subject, which has been dealt with in these columns on previous occasions, is very interesting, for the utility of the sun's rays in tropical climates for the production of motive power will undoubtedly be very beneficial to many places where other means are inaccessible, or are obtainable only at a very high cost. There are many places on the Nile where water power could be developed at a very reasonable capital outlay, and power supplied at very cheap rates. Engineers have often wondered why turbines were not utilised at the great Assuan Dam, where, combined with a hydraulic power plant, a great amount of power would be available for irrigation pumping, or driving factories in districts further away from the river. It is admitted that wherever water is available for power purposes it has a positive commercial value, and when an installation is made, its freedom from breakdown or repairs, and its high efficiency, places it in the front rank among prime movers. The owner of a water-power plant is rightly compared with a mine owner, the only difference being that the former is raising "white" coal instead of black. It is asserted that many large plants abroad produce power at an extremely low cost; in some cases it is less than £1 per horsepower year, when running on a twenty-four-hour service. And when mines of "white" coal are so numerous on the Nile, and power can be produced so very cheaply, is it advisable and more economic to attempt the utilisation of the sun's rays for what can easily be obtained by the utilisation of the water-power of the Nile?

According to reliable reports the Special Mining Committee of the Russian Ministry of Commerce has decided to recommend the transfer to American hands of a great part of the Empire's mines and mineral deposits. It was well known that since the early part of last year American engineers have been visiting various mining districts of Russia and especially those between the Black Sea and Caspian Sea, and as far south as the Baku district. The transfer to American hands of mines and possibly accompanied with certain privileges in that region will have considerable influence in the prospects of other engineering enterprises there as well as in Asia Minor.

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Under the auspices of the Food Production Department of the British Board of Agriculture, an interesting series of demonstrations took place at the National Economy Exhibition, Westminster Bridge to show the possibilities of fruit canning and preserving. The department has arranged for the supply of compact and portable plant for such purpose, bringing over from America in many hundreds of what are there known as "the Royal Home Canner," and is prepared to accept orders for the delivery. A system of "live steam" is used, any form of fuel, whether gas, oil, coal, coke, or wood can be employed, and if wood is utilised the lightness and portability of the apparatus permits it to be carried into the garden or orchard, thus obviating unnecessary handling or transport. Mrs. Cooper has been appointed organizer of this new branch of economy, which may well have far reaching effects in household management. The apparatus cost £6 10s. and the department is prepared to supply the cans at a very reasonable rate. The Queen has already ordered an outfit of the kind, and in many large households her Majesty's example is being followed. As regards the small-holder, it is pointed out that neighbours would be glad to buy at fair prices during the winter the commodities thus preserved,

while it is probable that an energetic individual who had thoroughly learnt the management of the apparatus might allow those around her to bring their own garden produce, paying a small sum for the temporary use of the "canner."

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The Kenora and English River Railway Company proposes to build a railway from Dryden, near Kenora, Ontario, to a point on the National Trans-continental Railway west of Superior Junction, thence north-westerly across the English River set of Lac Seul. The motive for constructing the railway is to develop a large pulpwood industry in the district covered. Incidentally there will be some agricultural and mining developments. The authorised capital is £400,000.

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Nature evidently intended man to be cleanly, thinks C. F. Saunders, writing in the *American Botanist*, for long before the invention of soap they had stocked the earth with plants capable of being used as soaps and quite as effective as the manufactured articles. In the United States alone, according to Mr. Saunders, there are half a dozen genera of native plants which contain saponin in sufficient quantities to make them of value for cleaning purposes. He says: "They are most numerous in the arid Southwest and on the Pacific coast, and are variously known as soap-weed, soap-root, soap-plant, and *amole*—the last being the name given by Spanish Americans. Of these soap-plants it is usually the root which is used, and all that is necessary to do is to dig this up, rinse it, crush it somewhat, and rub it briskly between the hands in water, when a lather is produced which quickly cleanses the skin, leaving it agreeably soft. In the case of several species of *Ceanothus*, which are particularly abundant in California the flowers and the green seed-vessels may be used with like effect. These shrubs are known as wild lilacs, and during their season

of bloom cover entire hillsides in places with a delicate veil of colour. There is one species of *Ceanothus* indigenous to the Atlantic seaboard and known commonly as New Jersey tea. It possesses the same saponaceous property. Perhaps the most interesting of our soap-weeds is *Chlorogalum pomeridianum*, a bulbous lilylike plant of the Pacific coast, which presents its soapy offering in a particularly neat manner. The bulb is the part used, and this on being dug up is found wrapt in a loose jacket of coarse fibre, which may be readily striped off, taking all stains of earth with it and leaving a clean, moist ball of 'soap' for instant use."

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How Japan has been able to establish new industries under the stimulus of war conditions will be understood by reading the notes submitted by the British Commercial Attache at Yokohama. During 1916 Japan exported ordinary paints to the value of £24,000 and also £12,000 worth of white lead. Paints worth £18,000 were imported from the United Kingdom before, but there is a large and growing production of paint in Japan itself now and the Japanese Government departments use home made products. Rope is largely made in Japan by three rope companies which import considerable quantities of hemp from Manilla and export hemp-ropes worth £40,000. Japan continues to import from the United Kingdom large quantities of chemicals and drugs, but her own production is also increasing. Chlorate of potash and phosphorus for the match industry are now being produced on a large scale in Japan. Drugs formerly came from Germany but are now being made in Japan, to some extent, following the German method in which the Japanese doctors are trained. There are several large sulphuric acid factories in Japan and superphosphates are manufactured for export. There is a considerable production of perfumes, hair-oil, and soap whose exports amounted to £350,000. Japan has greatly

extended her leather industry and tanning factories have increased.

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The manufacture of mat bags or market bags is a considerable domestic industry in the neighbourhood of Canton and in the Delta of the West River. The bags are made of a kind of coarse matting, and are provided with handles. They are usually shipped in bales containing 100 sets of four bags each, the price per bale being about 32s. f. o. b. Hong Kong.

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The manufacture of spelter within the Empire has for many years been quite insufficient to cope with the demand for the metal. In 1913 the production in the United Kingdom was only 26 per cent of the consumption, and in the whole of the rest of the Empire there was only one works and their output was not large. Stimulated by the war, the smelting capacity has been considerably increased and it may be of interest that the Ridge Roasting Furnace and Engineering Company, 2, Great Winchester Street, London, E. C., have supplied plant for this purpose to four different smelters and have just received a repeat order from Messrs. Vivian & Sons, Ltd. of Swansea, for further roasting plant. The fumes are to be used for making sulphuric acid. It is gratifying that an entirely British firm have made really important improvements in an industry which flourished before the war mainly on the Continent and in America. The fuel consumption has been reduced to below 50 per cent of the amount required in any mechanical roasting plant in this country, in addition to which there has been an appreciable saving in labour.

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A Government resolution on the report of the Civil Veterinary Department, Burma, shows that the past year was remarkably free from cattle disease. The deaths from rinder pest were 2,058 or one-tenth of the mortality from the same disease in 1912-13.

The Akyab and Salween districts were responsible for half of the cases. The Lieutenant-Governor trusts it may be found possible to make early arrangements for the introduction of preventive inoculation. The gross expenditure of the department was Rs. 2,86,756, or Rs. 11,000 greater than in the previous year, the difference representing the cost of stock-breeding. A committee has recently been appointed to report on the general conditions in Burma regarding stock-breeding and for the improvement of conditions, with special regard to the advisability of introducing co-operative methods.

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The profits of the 86 Bombay cotton mills in 1916 totalled 3.12 crores, if 42 lakhs paid to the agents as commission be included. For the whole of India, the profit of the cotton mills was estimated at 6½ crores—the identical sum made by the jute mills on the Hooghly in their boom-year. The profits of the cotton mills, however, are expected to be vastly greater during the current year, whereas those of the jute mills are showing a slight falling off. In 1916, the weaving mills in Bombay did better than the spinning mills and paid their shareholders an average of 15 per cent, as compared with an average of 5½ per cent in the case of the weaving mills. This disparity will perhaps disappear during the current year for the August price of yarn shows an even greater advance over the price of the last few years than does the price of cloth. Both tens and twenties are selling at nearly twice the prices obtained a year ago.

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The Egyptian sugar industry has developed very considerably since the war broke out. This is ascribed in some quarters to a largely increased use of chemical fertilisers. Before 1914, Egypt imported for its sugarcane plantations 20,000 tons of such chemical aids, whereas in 1915 the amount rose to 70,000 tons. The present expense for artificial manures in Egypt per acre of canes

is put at 20s. to 40s.; and as the results are favourable the allowance tends to increase.

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The *Statesman* writes.—During the past few weeks Indian industrials have been enjoying a distinct boom on the Calcutta share market and some rapid if not startling advances have been registered in certain stocks. Those who may perhaps be inclined to shake their heads conservatively over some of these startling figures may, however, be recommended to turn their eyes to the United States if they wish to see what industrial “sky-rocketing” in time of war is really like. Let them ponder, for example, the case of the Vulcan Steel Products Company which was organized last October with a capital of \$10,000, and which did business during the first month of its existence amounting to \$135,000. In November, this total was rather more than doubled, the turnover being \$300,000. For December, the figure was half a million dollars. The company kept on increasing its business at the same breathless rate month by month until in May last its turnover stood at \$6,000,000, and the figures for June are expected to show a still further increase. A record like this makes even the hundred-rupee rise look feeble by comparison.

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Progress is being made in Norway with the ingenious method of reducing the cost of paper manufacture by utilising the residue from the mills to produce a fuel which suffices to run the plant. The paper pulp obtained from wood constitutes only 45 per cent of the wood, and the residue of 55 per cent has hitherto been found useful chiefly for the wood alcohol and acetic acid obtained from it by distillation. By the new process the residue furnishes a fuel in the form of a powdered coal or charcoal which is said to evolve great heat in combustion. The first plants have been erected at Greker, on the Christiana fjord, and it is stated that they will shortly be able to yield an annual out-

put of 6,000 tons of this new fuel. Since the total production of paper pulp in Norway is estimated at 1,000,000 tons yearly, doubtless the other plant throughout the country will soon be similarly equipped.

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It is published in Japanese papers that the Japanese manufacturers of glassware and enamelled-ware are taking steps to organize associations with the object of restricting the export of inferior Japanese goods. For it appears that since the commencement of the war both the glassware and enamelled-ware industries of Japan have developed considerably, and in order to retain the trade manufacturers are desirous of ensuring the production of standard goods. As far as India is concerned, this is another indication of lost opportunity and amidst the conflicts of political reforms we have practically neglected the possibilities of industrial advance during the war. None of the committees appointed by Local Governments seem to have facilitated the establishment of new industries, and the easy triumph of Japan proves the helpless economic position of India.

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The Punjab Department of Agriculture is devoting some effort to the encouragement of European silkworm rearing in the submontane tract of the northern part of the province, where the temperate climate and a moist atmosphere are conducive to good silk-spinning. A family of three persons, it appears, can rear an ounce of seed. This is obtainable at a cost of Rs. 2-10 as. through the Director of Agriculture. This ounce of seed is composed of 30,000 eggs and to rear the resulting insects the leaves of 25 full-grown mulberry trees are necessary. With care the ounce of seed will yield from 38 to 48 seers of green cocoons which, after drying, weigh from 13 to 16 seers. It is estimated that after from two to three months the family should realise something between 25 and 48 rupees as the result of

its labours. The estimate suggests a cottage industry carried on as ancillary to some other form of labour rather than one on which an entire family could rely for support the whole year round.

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The total production of gold in the world last year amounted to \$470,442,068, according to the *Engineering and Mining Journal*. This was less than that of 1915 by \$8,110,154, or 1.7 per cent; but it exceeded that of 1914 by \$10,344,640, or 2.2. per cent. The most important gain shown in 1916, as compared with 1915, was of about \$6,000,000 in the Transvaal: but this was offset by decreases of \$8,720,000 in the United States and \$6,980,000 in Australasia. The Transvaal gain was due to intensive working of mines and a larger supply of labour. The loss in Australasia, on the other hand, resulted from scarcity of labour, from the diversion of capital to other fields and from the absence of prospecting, which has prevented the discovery or opening of new mines to replace those which have been exhausted. "Apparently the war has had little direct effect on gold production. Most of the producing countries are out of the direct track of the conflict. Even in Russia the only effect on gold mining felt was the withdrawal of working forces for the army, and this operated only to a moderate degree. Mexico's activity was diminished by internal troubles entirely. The only countries affected were in Europe, where the production is but small at any time."

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The value of inoculation as a preventive against disease among cattle is borne out by some figures given in the latest veterinary report for Assam. It is there mentioned that out of a total of 36,016 animals inoculated only 578 died, whereas in the rinderpest outbreaks alone, some 9,633 animals are reported to have died before inoculation. Mr Harris, the Superintendent of the Civil Veterinary Department, refers to the visit to

Assam of Dr. Macalister, Imperial Pathologist at Muktesar, as one of the important events of the year. The visit was undertaken with a view to investigating a mysterious disease in horses known as Kumri. This disease is found in every district and attacks and renders useless a considerable number of valuable horses every year. Dr. Macalister and Mr. Harris made an extensive tour in connection with the enquiry and, to quote Mr. Harris, were "able to see animals affected with the disease in its various stages. Eight horses were handed over unconditionally for investigation and *post mortem* examination from which valuable specimens were obtained for further research work at the Laboratory. A report on this work has not yet been published and this may be delayed considerably, as Dr. Macalister's services have been loaned to the Military Department. Since he left, I have had the opportunity of sending further specimens to the Imperial Laboratory from time to time. The disease seems to be incurable, but if the mystery, of its causation could be penetrated, suitable preventive methods might be adopted. This subject is of primary importance, because it is one of the reasons why fewer horses are being kept throughout the province."

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A new French cement is made from the scum of beet-sugar refining, until this year a useless waste. So rich in carbonate of lime this scum proves to be that 1,000 tons may be recovered in treating 18,000 tons of beets, and a mixture of this quantity of carbonate with 275 tons of clay yields the cement, which is stated to be of fine quality. The material is baked for a suitable time in a rotary oven, such as is used for Portland cement.

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An Indian industry which has been affected somewhat curiously by the war is mining, and strange as it may seem the net result is a diminution of activity. The report of the Chief Inspector of Mines for 1916, which

has just been issued, shows that there was a decrease of 17,831, or 9.90 per cent, in the number of workers in that year compared with the preceding year, and of this only 2,078 was accounted for by the diminution in the coal mines. The coal fields, as is generally known, suffer sharply from labour shortage, chiefly as a result of cholera and malaria epidemics, and it speaks well, therefore, for the organization with which the mines endeavoured to meet the special demands of the time that despite this the total coal output amounting to 16,419,982 tons showed a small increase.—41 per cent—on that of 1915. The mica mines showed an increase of 49.52 per cent in their output, chiefly because of the urgent demand for mica for munition making. For similar reasons there was an increase by 49.86 in the wolfram output. Oddly enough copper ore diminished by 66.65 per cent. The output of manganese increased by more than half.

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In the *Bulletin of the Imperial Institute* (1915, 13, 445) reference is made to various suggestions for utilising the refuse obtained in the course of extracting Sisal Hemp. In Yucatan it has been found possible to ferment the leaf-waste for the production of alcohol, and it is stated that most of the alcohol thus obtained is produced from leaves containing on the average, 12 per cent of sugar. Experiments which have been carried out in the East Africa Protectorate (Ann. Rep., Dept. Agric., B.E.A., 1914-15,) have shown that the juice of the leaves, whether grown at the Coast or in the Highlands, does not contain 3 per cent of sugar. A yeast has been isolated from the sisal plants which is capable of fermenting glucose solution, but is rapidly killed in the sisal extract, probably on account of the large quantities of organic acids present. On neutralising the sisal extract with Sodium Carbonate and adding a little glucose, it was found possible for the yeast to live but no fermentation was induced.

GLEANINGS.

There has always been at least a limited American demand for Red Sea mother-of-pearl shells, says the United States Consul at Aden in a recent report, and inconsiderable shipments from Aden to the United States have been made from time to time. During the second quarter of the current year, however, the declared exports of mother-of-pearl shells from Aden to the United States have been greater in quantity and value than the total annual exports of the shells for any one of the past ten years. During this quarter 129,920 lbs., valued at \$26,341, were shipped to the United States. There are several pearl fisheries in the Red Sea and Gulf of Aden, and before the war the pearl-fishing industry and the trade in mother-of-pearl shells were important. For the three years preceding the war the annual exports of pearl shells from Aden averaged 539,280 lbs., valued at \$113,233, the bulk of the exports going to the United Kingdom. Austria took the next largest amount. The pearl fisheries at present are not being worked to any considerable extent. The rest that the fishing-beds will have had will undoubtedly result in greater prosperity for the industry when the return of peace conditions permits it to be fully resumed.

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The question of the best way of securing cotton for use after the war is being discussed in Germany. Many people think it should be done by a syndicate of spinners, supported by the Government, but Dr. Edgar Landauer, in an article quoted in the *Kölnische Zeitung*, holds that the German Government cannot support a private monopoly of this kind. He advocates the formation of a cotton bureau formed on the model of the Reichsbank, with some private capital in it, and buying cotton independently.

This bureau should lay up stores and distribute cotton according to the needs of the place and the moment, but leave the trade uncontrolled. Evidently, cotton will be often difficult to buy long after the war. The question whether Egypt and India will in future deliver supplies to Germany is still uncertain.

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Consequent on complaints of the poor quality of goods which Japan at present exports, the Government have decided to enforce thorough conditioning of all export goods, and the particulars of the measure to be adopted are being considered. According to the official plan, the Association of Manufacturers, or their federations established in accordance with the law, will be empowered to condition all export goods on a compulsory system, and the Government will exercise general supervision over the organization of conditioning houses and the actual management of business, at the same time giving bounties to those associations. Among other goods, all kinds of braids, cotton, hosiery, glassware and other goods produced by manufacturers of comparatively small resources, will first be brought under the new system of conditioning.

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About four years ago the Italian Government took forcible possession of life assurance. The business became a State monopoly. Two outstanding objects in doing so were said to be, the reduction of the cost of management, and—in the profits to be derived from the business—creating a fertile source of State income. Life assurance is, however, not amenable to such treatment. The companies can be dragooned by the State, but not so the policy-holders. The companies may be extinguished, but this does not mean that the State, is about to capture the policy-holders. The belief is abroad that the venture has already turned out to be a distinct failure.

Professor W. H. Perkin, at Manchester says:—The difference in the amount of research work done in Germany and in England was roughly indicated by the fact that in 1915 there were in German universities and technical institutions 3,000 students engaged in research work and only 300 in this country. Under such conditions we could not hope to compete with Germany, and there was no wonder that industries which once seemed firmly established here had left us to flourish abroad.

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Dr. Schmid of Leipzig says that the science of economics, which has hitherto been devoted to working out the laws of peaceful intercourse, must consider the modifications necessarily to be brought about by the prolonged wars of the future. The fact may also be noted that the great extension of co-operative and governmental economic activity during the war will, in all probability, have a permanent effect in its reaction against the individualism of the nineteenth century.

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Cementing a carpet of heavy tarred paper to concrete factory-floors is recommended as a means of lessening the noise from trucks. After the floor has been given a preliminary coat of gray cement paint, a second coat is applied, with a coat to the under side of the paper, and the paper is then laid carefully in place, and made perfectly smooth with a roller or a wide tired truck. This sound-deadening surface, which is very durable, is said to improve with age.

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The exports of manganese ore from Brazil are advancing rapidly owing to the stoppage of exports from Russia, and the interruption of shipments from India to the United States, Russia and India having been hitherto the world's chief sources of manganese ore supplies. Brazil's exports go mainly to the United States and were 503,120 tons in 1916, as compared with 288,671 tons in 1915, and 183,630 tons in 1914.

MYSORE ECONOMIC CONFERENCE.

PROGRESS IN THE DISTRICTS.

Shimoga.

AGRICULTURE.

Agricultural Education.—The District Committee resolved to send up the following recommendations of the Agricultural Sub-Committee for the consideration of the Central Agricultural Committee: (1) that the ordinary Kannada Readers for primary classes especially in the rural areas be so revised as to contain a large number of lessons on Agricultural subjects; (2) that for the guidance of teachers in rural agricultural classes some simple Kannada textbooks on Agriculture may be prepared.

EDUCATION.

Opening of New Schools.—New schools were started at Hanchinasiddapur, Arhatosalu and Sante-kadur. A girls' school was started at Arakere and a private school at Yelavata. A night school has been opened at Kurva.

Reading Room and Library.—A Reading Room has been started at Arakere, and a sum of Rs. 50 has been collected in Devatiballi village towards the opening of a library.

INDUSTRIES AND COMMERCE.

A Home Industries Class.—The memo from the District Economic Superintendent, Shimoga, regarding the starting of a Home Industries class in sewing and dress making at Kalurkatte was read; and the Committee resolved that the class be started, and sanctioned a sum of Rs. 47 per month for the purpose.

Summary of Work.—A summary of work done by the Industries and Commerce Department in the District during the half year ending December, 1917, was read and recorded.

GENERAL.

Village Improvement Works.—Village Improvement Works amounting to Rs. 1,477 have been carried out by sixteen Village Improvement Committees in the Shikarpur Taluk, of which Rs. 1,200 refers to temple work at Adaganti.

The following villages have also executed improvement works to the extent of the amount noted against each: Masanikere—Rs. 2,500; Khasti—Rs. 800; and Tavarikere—Rs. 230.

District Itinerant Lecturer.—The Committee resolved to send up a recommendation to the Central Education Committee to sanction the proposed scale to enable them to appoint a graduate as the District Itinerant Lecturer.

CONFERENCES AND MEETINGS.

Kadur.

A Taluk Conference was held at Kadur on the 3rd January last, in a spacious pendal erected for the purpose. The proceedings commenced precisely at 12 noon under the presidency of Mr. C. Devaraj Urs, Deputy Commissioner of the District. There were more than 300 persons present on the occasion. After the reading of an address of welcome by Mr. Patre Veerappa, the Report of work done by the Taluk Progress Committee was read by the Secretary. During the period under review nineteen grant-in-aid schools had been opened. Eight school buildings at a total cost of Rs. 6,960 were under construction. The villagers had subscribed half the total cost. A further sum of Rs. 1,249-8-0 for the construction of school buildings at Muthangere and Chiknallur had been subscribed. A building for the Reading Room and Library at Singatgere had been sanctioned at a cost of Rs. 375, half of this amount being already contributed by the villagers. The area under cotton had increased by 800 acres. Twenty-seven improved ploughs had been sold in the Taluk, and 800 bags of oil cake had been supplied to the ryots for sugar-cane cultivation. The cost of charitable works such as sinking of wells, construction of *gokattes* and rest-houses by the ryots in certain villages was estimated at Rs. 11,100. Four new wells had been sunk and eleven more were under various stages of progress. Labour of half a day a week had been contributed in about fifteen villages in the Taluk. The total amount of work was estimated at Rs. 3,364. After the report was read the major and minor wants of the taluk were discussed. Among the more important subjects that engaged the attention of the Conference, the following may be mentioned: (1) Water-supply to Birur and Kadur, (2) Opening of a female dispensary at Birur, (3) Opening a road from Birur to Yegate, (4) Restoration of the Yellambalase anicut, and (5) Construction of a Town Hall at Birur. Mr. Patre Veerappa promised to contribute Rs. 3,000 towards the construction of the Town Hall at Birur. After the luncheon interval papers were read on subjects connected with education, agriculture, etc. The President in the course of his concluding remarks congratulated Mr. Patre Veerappa, Organizing Secretary, on the success which attended the Conference and the proceedings terminated with votes of thanks to His Highness the Maharaja, His Highness the Yuvaraja and other members of the Royal Family.

Hassan.

The third District Conference of Hassan was held in the beginning of January last at Hassan under the

Presidency of Mr. C. Venkata Rau, B.A., Deputy Commissioner of the District. In his opening speech the Chairman remarked that as a result of the war, the coffee industry was threatened with disaster owing to the withdrawal of shipping facilities, and prices of industrial articles and machinery had gone high. A special feature of the District Conference was that all Taluk Conferences were completed rather early to prevent overlapping with jamabandi and collection work. The President referred to the Health Exhibition that had been opened in connection with the Conference to educate the people and briefly reviewed the facilities created by Government during the year for the rapid development of the Economic Conference work. A brief report of work done during the year was then read. The Deputy Director of Agriculture, the District Inspector of Education and the District Economic Superintendent read their reports on the advance made in each of the Departments. Several graphs were shown indicating progress in education, agriculture and industry. The wants and requirements of the District were then discussed and the Conference concluded after a few remarks from the chair.

Siddlaghatta.

A meeting of the citizens of Siddlaghatta was held on the 29th December 1917, at which resolutions regarding the deputing of an officer of the Sericultural Department to train the people in the scientific methods of Sericulture, the opening of demonstration farms, etc., were passed. The people were anxious to have a tailoring class, a carpentry and weaving school, and an Agricultural Association. At Melur four miles off, the people were ready with subscriptions for building a village hall, a panchama school and raising flower and fruit gardens.

Holalkere.

A Taluk Conference was held at Holalkere near the Archallyhatti Chattram on the 18th December, 1917, with the Sub-Division Officer of Davangere in the chair. The Deputy Commissioner of the Chitaldrug District was also present. The proceedings commenced with a short preliminary speech by the President explaining the object of the Conference. The Amildar then read the report of work done in the Taluk during the year. A number of charitable and religious works such as sinking of drinking wells, construction of temples and school buildings had been undertaken during the year and the value of work turned out was estimated at Rs. 8,250. A sum of Rs. 898-6-0 was collected for the Village Common Fund in twenty-one villages. The report of Town Progress Committee was then read by the Secretary. This was followed by short and instructive lectures on education, co-operation and sugar-cane cultiva-

tion. The Horticultural Sub-Inspector spoke on the advantages of fruit culture. The major and minor wants of the Taluk were next discussed and local grievances heard, and suitable remedial measures were suggested. In bringing the Conference to a close the Chairman offered some useful and instructive criticism, and called upon the people to work unitedly and ameliorate their condition.

Hiriyur.

The fourth Taluk Conference was held at Hiriyur on the 6th October, 1917, under the presidency of Mr. T. Chokkanna, B.A., Senior Assistant Commissioner of the District. After the President's introductory remarks, the Amildar read a report of the progress made in the taluk taking stock of what had been done and what still remained to be done. He stated that work estimated at Rs. 9,212-7-7 was done in the taluk by way of free labour, and Rs. 3,999 by the aid of Government. The report of work done by the Taluk Progress Committee was next read by the Secretary. Papers were then read on subjects, connected with education, agriculture, industry and co-operation. The District Economic Superintendent spoke on the necessity of improving rural industries such as carpentry, smithy, etc., and urged the advisability of starting mat-weaving industry at Hiriyur as there was much scope. After the reading of some more papers, the major and minor wants of the taluk were discussed. Medals and certificates were awarded to the Committees and persons who had done good work in the taluk. The President in the course of his concluding speech observed that the work turned out in the taluk was satisfactory, especially as regards Village Committee Fund and Village improvement, and exhorted the people to work with co-operation and real interest.

CORRESPONDENCE.

To

The Editor,

*Mysore Economic Journal, Bangalore.***Weaving Factories at Molakalmuru.**

Dear Sir,—I notice a reference on page 579 of your November issue to the starting of a weaving factory at Molakalmuru by Mr. Kubbaji Siddappa. As the statement is very bare and the attempt to revive the old factory in that place will be of interest to your readers, I hope you will kindly allow me a little space for the details of the matter. This is part of an attempt to set up the ex-students of the Government Weaving Schools in the Province in the trade which they learnt at school and it is a matter full of promise to us. This weaver Siddappa, who is a teacher in the Local Anglo-Vernacular School has come forward to work out the plans which we have in view. There was an old weaving factory of four handlooms which had been started by an informal association of eight members from Molakalmuru each contributing an amount of Rs. 50 to rig up the equipment and to provide a small working capital for keeping the factory going. After having worked about a year, the factory practically ceased to work as the difficulties in the way of a regular supply of materials and an organized market for the goods were too much for a small factory of that size. I made some enquiries at the time of my first visit to the Molakalmuru Industrial School and learnt that Rudrappa, brother of this Siddappa, had learnt this trade at the Industrial School and was in charge of the small factory, but that for want of sufficient equipment and of floating capital he was unable to keep it at anything like full work. I had made a suggestion that the accounts should be properly written up and the exact state of the assets and liabilities of this informal association ascertained from all the available papers. And at the time of my last visit to the place I was able, with the help of Mr. Sanjiva Rao, Superintendent of the Textile Factory, to close the accounts and arrange with the association to hand the factory over at a fair estimate to this Siddappa.

The chief idea on which it is proposed to help this and similar small concerns is that, very often when a good student of any industrial school finishes his training and leaves it to start life he is seriously handicapped, not only by insufficiency of materials and equipment but also by the absence of an organi-

zation to market his products to the best advantage of the workman himself. It has now been suggested that the Textile Factory at Bangalore should supply the finer qualities of silk and yarn so that articles of approved pattern which find a ready market at Bangalore may be woven in these small factories under the guidance and supervision of our ex-industrial school students and the woven products sent up to the Textile Factory for effecting a sale on the Bangalore market. The difference in the line of profits that such an arrangement would bring about may be easily gauged from the statement that while raw-silk is sold by weight at between six to seven annas a tola the best quality of finished silk products of Molakalmuru, viz., towels fetch only nine annas a tola, while it is quite a common experience that imported articles of similar materials from Japan or Italy fetch as much as Rs. 1-4-0 to Rs. 1-14-0 a tola, on the Indian market. It is, of course, admitted that we cannot give the finish that Italy or Japan has been able to produce, because of the absence of calendering and other machines here. But it is believed that there would be no difficulty in securing at least one rupee a tola of the finished product if sufficiently good raw silk is supplied to the factories, the products woven under careful supervision of our ex-students of the weaving schools and the manufactured articles sent to the Textile Factory at Bangalore for marketing. Silk coating material which is one of the articles most in favour in Bangalore fetching nearly a rupee a tola by weight of the finished goods. The initiative has, therefore, been taken in the case of this factory at Molakalmuru, which supply good quality of yarn and silk-thread to approved students and ex-students of the Industrial School and help them to find a very profitable market for their finished products in centres far remote from their homes. This experiment is full of promise and after some experience in working this out, it is hoped to extend this principle to a number of other centres and thus create a network of small high-quality-work handloom factories to be worked mainly by and through ex-students of weaving schools and link all these up to a central organization like the Textile Factory at Bangalore, so as to find for their products as profitable a market as possible and give these weavers the best benefit of the training they have received.

Bangalore,
4-1-18.

S. RAGHAVENDRA RAO,
Technical Assistant to the
I. G. of Education in Mysore.

A Common Sense Educational System.

Sir,—In the August number of the *Nineteenth Century and After*, there is an article entitled "A Common Sense Educational System" in Denmark. To those in authority in matters Educational as well as to the public I think the article is interesting, important, instructive and of economic value. The article deals with all kinds of Education to all classes and grades of people, both boys and girls, both literary practical. Schools there are generally of three kinds and all these schools which are communal, are now free. The Education system is not only confined to Copenhagen but to the whole Kingdom of Denmark though the capital is more fully dealt with. There are three series of classes and three standards of teaching. One series of classes are intended for children who through nervousness, mental slowness or some other defect are a little below the average intelligence and must therefore be taught with special care if they are to learn easily and this is called HJOELPE. Another series of classes are for those who are so far below the average that they must be taught by special methods, if they are to learn at all. This is called VOERNE class. The third set of classes are for those children that are of an average intelligence. In these classes there are on the average twenty-nine pupils while in the other sets of schools the average attendance ranges from ten to twenty. Three hours of work in these two sets of classes is reckoned as four hours teaching in the ordinary classes. This system which is quite unique does not obtain even in English Schools for in England outside London and few other towns, the pupils are clubbed together just as much as in India. In Copenhagen, the children who are in the town educated are divided according to the ability into five distinct sections; and for each section there is a different standard of teaching, and practically a different method, so that children in each section may be taught according to the method by which they are best able to learn.

Every child in Copenhagen, who is not taught in home must go to school as soon as he is seven years old and he must continue going to school until the completion of the fourteenth year or fifteenth year if he is admitted into a middle school. He is placed at first in the lowest of the ordinary classes and if he is of average ability, he is expected to work his way up to the highest. A sharp watch is kept on him and as time passes on if he seems dull or depressed or is making no progress he is transferred to one of the other sets of classes above mentioned. There he receives more individual attention, and his lessons which are all *viva voce* are shorter and fewer and

easier. There what the teacher aims at is the boys are to be alert, to use their eyes to observe carefully, compare and take an interest in what is going on around them; to use their fingers too and through their fingers gain some idea of form. They are being brought up carefully in all good ways of a future citizen. They are further taught to be truthful, obedient, orderly and courteous. Infinite trouble is taken to put a stop to anything in the way of brooding or sulking in the children and to keep them cheerful. A child in these schools need not stay long. If he shows improvement in mental alertness he will be sent to ordinary school or class. Any how the boys are lifted from one set of classes to the others according to the improvement they make or *vice versa*. In these lower set of classes besides teaching reading, writing, and Arithmetic or in their places pictures, counting, experimental lessons form part of the curriculum. The best boys are not put in the same classes as the worst, and they are not allowed to mix, or associate with the latter. Though the clever and stupid must all go to school they must not be clubbed together. They must be sifted and sorted with infinite care. Unless this be done both the clever and the stupid suffer; for it is found that they neither learn so much as they might learn because neither are taught as they ought to be taught and the result is tempers are ruffled, nerves are set ajar, and there is friction all round.

The School Director in Copenhagen is responsible for the Education of every child in the City, and on him rests the full responsibility for the right spending of every penny the town spends on Education,—Primary and Middle. He organizes and re-organizes the schools, he directs and controls them, is in close touch with every schoolmaster or mistress whom he appoints acting as their friendly adviser as well as their official chief. In fact he fills the position of a District Inspector of our State only with this difference that while the former is the sole agent for Education of the pupil of the town or state, the latter is hampered in his work by orders emanating from a supervisor's agency with a divided and therefore misunderstood responsibility. The recruitment of pupils to the higher schools is somewhat on a similar line to that obtaining in the Indian Education System. The pupil remains in the ordinary class till he is eleven and goes through the regular course of elementary training and then passes on to the middle school where the Education is good all round fitting him to make his way in the world. He or she may aspire to any position and earn a decent living. He is then sent to gymnasium where the town pays all his expenses and after a complete course there, he passes on to the University where the State pays him. Thus we have what are called a regular gradation

of course in Denmark: (1) Communal schools with three senior sets of classes purely elementary, (2) Middle schools, (3) Gymnasim answering to our High Schools Department, and (4) Colleges and University. The poorest boy or girl can be sure of the highest University qualifications provided there is merit in him or her and vie with the son or daughter of the highest man in the State, and at each and every stage the people, townsmen or the State bound to pay him or her for food, clothing and books. This Education is Compulsary in fact as in theory. No mother ever dreams there of keeping her child at home to do for her some service or shopping or to mind the baby; for she knows that, if she did dire punishment would speedily overtake her. She would in turn be warned, threatened and fined and if necessary she would be imprisoned. She knows too that her friends and neighbours would all be against her in the matter. There the very man in the street is alive to the fact that to spend money on schools and then allow children to absent themselves from schools is wickedly wasteful, as well as shortsighted and unwise.

The schools are held both in the mornings and evenings for different sets of students. Hence there is economy in the matter of school building and it was found as a matter of fact that most children learn as quickly in the morning as in the afternoon in the schools of Copenhagen. It is needless to state that girls and boys fare equally well in schools. Co-education is in force in several schools. Needlework is a special subject for girls; we have what are called *house wifery schools* for grown up girls. In the schools built for the purpose a portion is arranged as little kitchens, sculleries and wash houses. The girl turns and turns about black, leads the grate, makes the fire, cleans the hearth, sweeps up dusts and trims the lamp, prepares a meal. She washes up and sets things straight. She steeps clothes, washes them, dries and irons them. She does every thing in fact that she will have to do later on, when she has a house to own. The girls are regularly taught how to market.

Next we have a unique arrangement for boys and girls called "Co-operative holiday arrangement." Every year some thousands of the Copenhagen School children spend their summer holidays in the country as the guests of the peasant farmers, dairy men or even agricultural labourers. They live and fare in all ways as the children of their hosts and helping them in agricultural work. They enjoy the holiday trip though they have to rough it sometimes to sleep on straw. They come back to schools much better in health and strong in body while their eyes are brighter and their minds are more alert with their little heads teeming with new ideas. This

Co-operative holiday arrangement has the following good points; (1) It costs practically nothing, (2) It works smooth, (3) It benefits the children kith and kin, (4) It brings town life and country life together, (5) It encourages mutual service, friendships and good will, (6) It inspires a love for the country in town's folk, and (7) It draws diverse sections of the community together; weaves bonds of friendly sympathy and spreads the light even among the lowest section.

Another interesting point is that students are honorary teachers in night schools where all the working men and women are taught. On holidays they keep company with them. They deliver lectures to village folks. They live as guests to the work-men partaking of their humble fare. They feel what Education they receive they must impart. The Danes boast that there is no unenlightened class in their Nation and they do so with good reason. No workman is illiterate. No man goes without reading newspaper. No one is ignorant as to what goes on in Folketing (National Assembly).

I said in the earlier part that poorest children are taken greatest care of in the matter of education. As regards the rich, the State has a watchful eye over them. In Denmark, it is a crime for a father who has means to stint his children the necessaries. The medical men keep a sharp watch on parents and children alike, for it is a part of their duty to see that the town's future citizens are not being robbed of their chance of development into strong, healthy men and women, able to fight their own battles and make their own way in the world.

It must be the earnest prayer of all patriots in Mysore that a day may come when she can stand by her sister with a smaller area and population in the matter of perfect educational system.

M. S. RAMACHAR,
District Economic Superintendent.

Bombay Exhibition of Food.

Sir,—The following is an explanatory note to samples exhibited by the Technical Laboratory, Department of Industries, United Provinces, Cawnpore.

1. *Refined Tallow*.—A cheap process for refining country tallow has been worked out in this laboratory, and a firm in Cawnpore have put down an up-to-date plant for producing a high grade tallow for use in textile mills.

The refined article is guaranteed to be of a pure white colour, to be free from adulterants and uncombined fatty acids and to possess a much higher melting point than that of ordinary tallow. A complete analysis will be sent to all bonafide enquirers.

The firm in Cawnpore are in a position to undertake large orders.

2. *Potato Starch (Farina)*.—The manufacture of this important sizing material has been fully gone into in this laboratory and a firm in this Province has taken up the matter commercially. It is hoped that the article turned out by this firm will be able to compete favourably with imported farina even during normal times.

3. *China Clay*.—Experiments have been carried out to work up certain deposits of China Clay near Jhansi and to ascertain if the refined article so obtained compares favourably both as regards price and quality with the imported China Clay used by Indian Textile Mills. The results obtained are very encouraging and steps are now being taken to start the industry on a commercial basis.

4. *Kori Kan (Urginea Indica) Gum*.—This is yielded by a variety of Squill which occurs wild near Jhansi. The gum has been examined in this laboratory and found to be a very good sizing agent. A process for manufacturing the article on a commercial scale has been worked out and a firm has taken up the matter.

5. *Soda Ash*.—This is a sample of the article now being regularly turned out by the Government Soda Factory, Cawnpore. The raw material used is "Reh or Sajji Matti", which is an efflorescent deposit on *Usar* (barren) lands. The soluble portion of this deposit consists of a mixture of Sodium Carbonate, Sodium Sulphate, Sodium Chloride and small amounts of Magnesium Chloride. The finished Soda Ash turned out by the factory contains 86–90 per cent Na_2CO_3 the remainder being moisture, and impurities. A complete analysis can be had on application to the undersigned.

6. *Vegetable Fat (Bassia Butyracea Fat)*.—This fat occurs in fairly large quantities in this Province. It has been worked upon in this laboratory so as to produce an article which may be safely recommended for edible purposes.

7. *Glue*.—Three samples of glue, manufactured by a firm in Cawnpore under the supervision of this department are being exhibited. These samples are far superior to the average Indian glue, and the firm referred to above are in a position to undertake large orders for this high grade article.

8. *Thymol (A and B)*.—These samples have been made in this laboratory from *Carium Copticum* (Ajowan) seeds. This department has helped more than one party to manufacture the article commercially. Intending purchasers can be put in touch with manufacturers working under the advice of this department.

9. *Clove Oil*.—This important Essential Oil has been fully investigated in this laboratory and a firm

is just starting to manufacture the article commercially.

10. *Camphor (A and B)*.—The samples exhibited have been prepared in this laboratory and are guaranteed to be quite pure and free from natural impurities which are found in incompletely refined Camphor. The production of this high class Camphor has been taken up by a firm in Cawnpore who are in a position to meet large orders.

11. *Banslochan (Bamboo Camphor)*.—This is an important medicinal preparation largely used by Ayurvedic and Unani medical practitioners. The sample submitted has been prepared in an up-to-date plant devised by this department.

12. *Extract Belladonna Sicc*.—This has been prepared from leaves of *Belladonna Atropa Linn* grown on Government plantations in this Province. The extract meets the requirements of the British Pharmacopœia and contains 1 per cent of total alkaloids. Steps are now being taken to manufacture the extract on a large scale.

13. *Majith, (Rubiâ Munjista), Extract*.—This is a valuable red dye which gives quite brilliant and fast shades on wool and cotton. The yellow dye contained in Majith has been eliminated and the extract may serve as a good substitute for Alizarine Paste. This department is in touch with large suppliers of Majith and it is proposed to prepare a few cwts. of the extract and place it on the market.

N. B.—Bonafide enquirers will be given any further information about these products on application being made to the undersigned.

Technical Laboratory,
Department of Industries,
U. P., Cawnpore.
Dated 15th Nov. 1917.

J. P. SRIVASTAVA,
M. Sc., (Vict.)
A.M.S.T.,
Industrial Chemist to
Government., U. P.

What to do with Useless Records?

Sir,—It is a well known fact that there is a practice of burning the time barred records, once in three months or every year, in every Taluk and District, to the Government regulation.

The amount of record, thus burnt, may come to 8,000 maunds, carrying a price of 10,000 Rupees at the rate before war.

Is it not regrettable to see that such a large amount of paper is being burnt into ash, in spite of so much civilisation and enlightenment.

I am at a loss to understand why the Mysore Economic Conference Committee has not yet attempted to put an end to such a terrible loss, and I wish to know what sort of inconvenience do the Mysore

Government feel in converting the above said records into pulp, out of which a large amount of card-board may be prepared and sold at a high price.

It appears to be good on the part of the Government to spend the money thus earned for any charitable purposes.

In case the above scheme is not appreciable and possible for the Government, why should not these useless records be used as fuel to cookery in the Government factory?

Mysore,
26-12-17.

U. S. BASAPPA,
Merchant.

QUERIES.

Hints to Correspondents.

Write on one side of the paper only. (2) Write each query on a separate sheet of paper. This will facilitate answering questions as in many cases they may have to be referred to experts. Put your name and address down on every such sheet. No attention will be paid to unsigned queries. (3) Drawings for illustrations should be on separate sheets of paper. They must be made in black ink only on white paper—not in pencil or colour—and twice the size they are intended to appear, especially reference letters and figures. (4) Put titles to queries, and, when answering queries, put the number as well as the titles of the queries to which the replies refer. (5) No charge is made for inserting letters, queries, or replies. (6) Letters or queries asking for addresses of manufacturers or correspondents, or where tools or other articles can be purchased, or replies giving such information, cannot be inserted except as advertisements. No question is answered through the post. (7) Letters sent by correspondents, under cover to the Editor, are not forwarded and the names of correspondents are not given to inquirers. (8) As the space devoted to queries and replies is limited, they should be drawn up as briefly as possible. (9) To facilitate reference, correspondents, when referring to any letters previously inserted, should mention the number of the letter, as well as the page on which it appears. (10) All communications should be addressed to the Editor, *Mysore Economic Journal*, "Ringwood", Bangalore.

Query 3. I shall feel greatly obliged if you were to kindly inform me the best and most selected recipes for dyeing hides and skins for the manufacture of boots and shoes.

Banganapalli.

M. H. P. GHATALAH.

BOOKS IN BRIEF.

Our money and the State.—By Hartley Withers. John Murray, London. 3sh. net.

It is always a pleasure to review a book by Mr. Hartley Withers. In this as in his other books, Mr. Withers, addresses himself to his readers in his usual popular style. He is a master in the art of imparting scientific knowledge in language easily understood by the masses. In the compass of a small volume of not more than a hundred pages, he reviews the purposes for which, and the means by which, the State takes money from the citizens, the limits of its power to do so, and the extent to which better understanding of national finance and a high sense of public duty, combined with wise spending by the State, can increase the amount of wealth which the citizens will be ready to devote to national purposes. Mr. Withers tellingly points out the fallacy involved in the idea that borrowing by State makes posterity pay. He shows how delusive this popular idea is and how the War is paid for as it goes on and how borrowing only affects distribution of posterity's income and no more. He is, frankly speaking, for taxation rather than borrowing by the State for meeting the cost of the War. He has incidentally much to say on the ideal of what an income-tax should be. He (we think) rightly insists that income-tax should be imposed on the part of the income which is spent rather than on what is earned. He has also interesting remarks on how far the State can earn revenue by trade enterprise. Though he is not by any means a supporter of what may be termed State Socialism, it is clear he would not stand in the way of the State trying its hand in this new line if it can win its spurs "in a fair field and not with the support of privileges and monopolies and subsidies, still less with the help of tariffs."

Elements of Indian Mercantile Law.—By S. R. Davar, Bar-at-law and Principal, Davar's College of Commerce, Bombay. Ramachandra Govind & Son., Kalbadevi Road, Bombay.

This is an excellent hand-book and ought to prove highly useful to students in our Commercial schools. Mr. Davar has produced a book at once handy and perspicacious. The principal Acts dealing with the law on the subject—the Indian Contract Act and the Indian Companies Act—are given as appendices. The book proper contains a clear exposition of the various branches of Mercantile law under appropriate headings. The reference to case-law is not heavy but adequate for the purposes of the average student. Besides students, those who engage in Commercial undertakings would do well to study this

well so that they might be enabled to do their daily work more efficiently.

Sir Dinshaw Edulji Wacha's Speeches and Writings.—G. A. Natesan & Co., Madras, Rs. 3.

Sir Dinshaw Wacha, whose writings and speeches are here presented to us, has not been a mere critic of Government on the administrative side. With mercantile leanings from the beginning, he has been a life-long student of Indian economic problems. He has spoken and written on it with vigour and out-spokenness for over thirty years. Out of seventeen speeches and papers herein included by the publishers, we note as many as thirteen deal with Indian monetary, trade or commercial problems. That shows the man. In the appendix we have his evidence before the Welby Commission and his rejoinder to Mr. Jacob's evidence. Two notable defects in the volume as presented we would point out for rectification in the next edition. One is a brief estimate of Mr. Wacha's in this domain of his public work and another is a more copious index than the one given us.

ACKNOWLEDGMENTS.

The Mercantile Directory of Japan, 1917-18.—Laxmichand Dossabhai & Bros., Publishers and Proprietors, Rajkot (Kathiawar) and Bombay. Price Rupees Five.

Y. Narayan's Typewriter Manual.—Indian Price, Rs. 3 Nett. Law Printing House, Madras.

Proceedings of the Board of Agriculture in India held at Poona on the 10th December 1917 and following days (with appendices). Calcutta, Superintendent Government Printing, India. Price As. 13 or 1s. 3d.

Report on the Progress of Agriculture in India for 1916-17.—Calcutta, Superintendent Government Printing, India. Price As. 12 or 1s. 1d.

Progress and Problems of Industrial India.—By S. Ambravaneswar, M.A., (Hons.), B. L., Trichinopoly. Price As. 6.

RECENT PUBLICATIONS.

Report on Agricultural Damage by Vermin and Birds in the Counties of Norfolk and Oxfordshire in 1916.—By R. T. Gunther, Fellow of Magdalen College, Oxford. $8\frac{1}{2} \times 5\frac{1}{2}$, 92 pp. Milford. 2s. 6d. n.

Penny Railways.—A practical railway reform. By Herbert Birch. $7\frac{1}{4} \times 4\frac{3}{4}$, 16 pp. Spon. 6d.

Social Problems and Christian Ideals.—Short papers on points of importance in the reconstruction of Society on Christian lines. Edited by Rev. E. A. Wesley, Rural Dean of Liverpool South, and the Rev. J. R. Darbyshire, Vicar of St. Luke, Liverpool. With a foreword by the Bishop of Liverpool. $7\frac{1}{4} \times 4\frac{3}{4}$, xiv. + 115 pp. Longmans. 3s. n.

The Land or Revolution.—By R. L. Outhwaite, M. P. $7\frac{1}{4} \times 4\frac{3}{4}$, 114 pp. Allen and Unwin. 1s. n.

Statements showing the progress of the Co-operative Movement in India during the year 1916-17 have been issued in book form by the Government of India in the Department of Revenue and Agriculture. The total number of Societies has risen during the year to 23,036 as against 19,675 in the previous year. There were 757 Central (including Provincial Banks and Unions), 21,070 Agricultural (including Cattle Insurance and Re-insurance Societies) as against 605 Central, 18,051 Agricultural and 1,019 Non-Agricultural Societies in 1915-16. The total membership and working capital at the end of the year were respectively 10,45,425 (as against 9,18,436 in the previous year) and nearly Rs. 1,223 lakhs (as against nearly Rs. 1,032½ lakhs in the previous year). Of the total working capital share capital paid-up amounted to about Rs. 212 lakhs, loans and deposits held at the end of the year amounted to about 918 lakhs (from Members 79, from individual Non-Members 388½, from Societies, 32, from Provincial or Central Banks 40½ and from Government 17) and reserve fund amounted to about 92 lakhs. Corresponding figures for the previous year were 177½, 775 and 79 lakhs respectively. A statement is added showing the operations of the Cattle Insurance Societies which at present exist in Bombay, Bengal, United Provinces, Burma and Coorg only.

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SCIENCE: SOME NEEDS IN ITS TEACHING AND SOME APPLICATION OF ITS METHODS TO ECONOMICAL AND SANITARY PROBLEMS.*

BY GILBERT T. WALKER, C.S.I., M.A., SC.D.,
F.R.S.

THE visit of the Science Congress to Lahore at this its Fifth Meeting is to my mind appropriate, not merely in view of the importance of the engineering, agricultural, educational and sanitary questions that arise in the Punjab, but also because of its close associations with Sir Denzil Ibbetson. His reputation for strength, ability, and devotion to duty was such as almost to overshadow the fact that he was, I believe, the only member of the Imperial Executive Council during the past twenty years with a scientific training; and that his knowledge of mathematics, physics, and chemistry was more than that of an amateur I can personally testify. Let us not forget the splendid demonstration that his career has given to India of the value of an education in modern subjects.

Since we separated a year ago at Bangalore we have lost two of our most prominent

* Being the Presidential Address to the Indian Science Congress which opened at Lahore on Wednesday, 16th January 1918, specially revised by the author for this *Journal*.

members, both of whom were to have presided over their Sections at this meeting. Dr. E. G. Hill was educated at Leeds and Magdalen College, Oxford, joining the Educational Service in 1895 as Professor of Chemistry at the Muir College, Allahabad. Shortly afterwards he became Dean of the Science Faculty, and in 1913 he was appointed Principal of his College. He contributed a number of original papers on a variety of chemical subjects, was interested in meteorology, and from an early date saw the need of giving his pupils such a training as would fit them to take up the commercial applications of chemistry. He died on 28th June at the age of forty-five.

Professor J. H. Barnes was educated at the Birmingham University, and in 1906 was made Agricultural Chemist to the Punjab, being appointed Principal of the Lyallpur College two years later. A few months before his death from enteric on the 2nd June, he was selected as chief chemist at the Pusa Agricultural Institute. He carried through a considerable amount of research in agriculture, some being of great importance in connection with the growth of sugar-cane and of wheat. Lately he worked out methods of producing excellent crops of wheat on land that had previously been barren from alkali, and of preventing the damage done to stored wheat by insect pests. Both Dr. Hill and Professor Barnes did their work in spite of periodic ill-health, and both ought to have had many years of activity before them. I would express the respectful

sympathy of this Congress to their relations.

In whatever direction we turn we see profound changes of attitude brought about by the present world-struggle, and we ought to remember that upheavals of thought, like physical convulsions, have their dangers. Just as a prudent man will, after an earthquake, examine his house to see whether it is safe, so it is essential that we should make sure of our ideas as modified by the war. In India as in England many men have realized that a neglect in education of the study of Nature involves terrible penalties to nations as to individuals in their struggle for existence: and there is a widespread resolve that the teaching of science and of its technical applications shall occupy an important place in our colleges. But this resolve is not in itself sufficient. Unless we make certain that the new education is effective, our action will be like that of a certain Persian Monarch who, having to adjudicate upon two poems, had one of them read to him and at once, without further investigation, awarded the prize to the other! I propose therefore to devote the first half of my remarks to some features in our science teaching that appear to me of importance.

Now it has, I think, to be admitted that in England the teaching of mathematics, physics, and chemistry, though less bad than the teaching of classics, has been far less efficient than it might have been. It has included tables of facts instead of ideas, and has been abstract in its methods where it should have been concrete. In England it is now being realized that if you teach Latin as if it were a language the time spent in learning to read it may be reduced to a half of what it was, and it is equally true, though not so well known, that the time devoted to arithmetic, algebra, and geometry could have been divided by two by the elimination of what is absolute or maintained solely for examination purposes. If a boy is taught

for some months to draw geometrical figures with ruler, set square protractor, and compasses, he will acquire concrete ideas about circles and triangles in addition to training his fingers and learning the meaning of accuracy. Numbers of facts about a circle will be obvious to him which he will never be able to deduce without help from the statement that it is a plane figure bounded by a line called the circumference and such that the straight lines from all points on the circumference to a certain point within it are equal. The ordinary argument for Euclid was that its severe logic taught the art of reasoning. But to the real mathematician the lengthy argument seems largely verbiage, concealing the essentially geometrical ideas; while to the severe logician the reasoning is in quite important respects incomplete and inaccurate. As one of my Cambridge logical friends remarked:—"Euclid would be a much better book if it did not make so hysterical an appeal to the emotions."

I have dealt at some length with geometry, although the teaching of arithmetic and algebra is as bad, because I want to emphasize the fact that it is better if we can make a boy see mathematical relations by intuition, rather than merely give his mental assent to proofs in which he can see no flaw.

I remember, at a British Association Meeting, Fitzgerald, one of the finest men of science that Ireland has produced, was challenged for his reasons for a belief that he strongly held, and he silenced his opponents by replying that he 'felt it in his bones.' It is this kind of instinct that distinguishes the most capable men wherever we find them. Another example is that of S. Ramanujam, whose Mathematical work I saw something of about five years ago while he was still a clerk drawing about Rs. 50 a month in the Port Engineer's Office at Madras. He had never been to a university, but he had discovered hundreds of theorems

in several very advanced branches of pure mathematics. To me the most surprising feature of his work was the small attention that he seemed to pay to formal proofs, and it was this as much as anything else that suggested his genius. As you know, Madras gave him a special scholarship to send him to Cambridge, and there he has shown himself a mathematician of the first order who will earn an international reputation.

I do not assert that any students who may be among my audience will convince their teachers of their transcendent ability by contemptuous refusal to learn book-work. But I differ entirely from the view, which is widely held, that for a professional man insight matters little provided there is textbook knowledge. What is wanted in life is ability to apply principles to the actual cases that arise; and the man who understands is of enormously greater value than the living compendium of information. When Pasteur as a chemist was asked to find a remedy for the pest that was ruining the French silk industry, he knew absolutely nothing of silkworms; yet he solved the problem, and it was general understanding of Nature's methods that brought him success. For mere information a sensible man goes to books of reference; he does not waste energy in burdening his memory with it.

But if it is a pity when the teaching of mathematics is made lifeless, it is fatal when that of physics or chemistry is carried on without constant appeal to experiment. A boy who has played with a force pump has no difficulty in grasping what we mean when we say 'head of water,' though the idea may be hard if based on the abstract definition of a 'perfect incompressible liquid': and such corresponding electric terms as 'electromotive force' and 'capacity' are just as easy to a boy who has played to an equal extent with electric apparatus. But how many are nearly as familiar with

electric appliances as they are with mechanical? And why should we wonder then that electromagnetic theory is usually found difficult?

Now all that I have said applies more to Indians than to Europeans for two reasons. First, the wonderful memories of most students of this country must be a continual temptation to them to remember a discussion rather than to absorb its ideas when memorising is easier than grasping; and secondly, early training in handling tools and apparatus is not nearly as general here as in England. As an example of what I mean I may be allowed to refer to my old school days at St. Paul's where, in addition to splendid laboratories for physics, chemistry, and biology, there were prizes to encourage mechanical ingenuity and skill, and as evidence of the standard reached I remember one boy was someway down the list although he had made a gyroscope that would spin for twenty minutes. I have no data as to the number of us that had collections of electric apparatus or small chemical laboratories or fitting shops at home; but it was appreciable, and to those who had them they made an enormous difference. They made the laws of Nature real, concrete, and vivid, instead of mere abstract relations between quantities known only by definitions.

Training of the hands is necessary also for the acquirement of manipulative skill, without which many discoveries would never have been made. As one example I will quote the Cape Astronomer Gill, who developed methods of measuring angles in the sky to one-hundredth of a second, the angle subtended by a quarter-anna piece at a distance of 330 miles, half the distance from here to Karachi. As another example we may take Ramsay's determination of the atomic weight of the rare gas niton. The largest volume of it that he could obtain was $1/200$ of a cubic millimetre, not a hundredth of a pin's head in bulk; yet he utilized a

balance so inconceivably delicate as to weigh this minute amount correctly.

Having considered briefly the subjects of instruction let us glance at the methods of testing our students. I think that one of the most disappointing facts learned in the twelve years that I spent as a Lecturer in Mathematical Physics at Trinity College, Cambridge, was the amount of time and energy that had to be spent both in examining and in revising the methods of examining. A genius like Stokes or Kelvin works out a theory which after a time finds its way into text-books and becomes a suitable subject for examination questions. It is placed in the syllabus and then its degeneration begins. The questions become crystalized in type, and the theory may remain in the syllabus long after it has ceased to have a living interest: it may even be that its basis has been destroyed by more recent discoveries. In Cambridge, as in India, vested interests are powerful, and it was only the zeal of its teachers and the healthy opinion of a resident Senate, which included some sixty Fellows of the Royal Society, that made it possible to effect from time to time the drastic reforms that were necessary.

Such degeneration as this is unfortunately not confined to science. The founders of schools of painting or of music produce ideas which in their followers sink into mere mannerisms; and in the history of religion or morals the collapse is even more conspicuous. To quote examples of this in the big world-religions is as unnecessary as it would be depressing; so I will draw merely from those survivals of primitive religion or superstition which form a perpetual reminder to the educated classes of all countries of their brotherhood with the savage. Some of you may realize that in Europe when a soldier's charger follows his master's coffin in his funeral procession this is a piece of ritual surviving from times long ago when the horse was killed in order that his master might have him to ride in the

other world; but how many of us understand the ritual that binds us in certain circumstances to throw salt over the left shoulder, or to throw a shoe after a newly married couple? The old ritual that gets rid of devils by driving them into animals still survives in England. Some twenty years ago in a village outside Cambridge there was a case of small-pox, and the peasants, good Christians as they were, had little idea, when they drove a number of sheep through the infected cottage, that they were getting rid of the devil of small-pox by giving it the sheep to enter into. In the same way these shepherds of our youth, I venture to think, have little idea, when they drive their flocks through their routine text-books, that there is grave risk of setting free the evil spirits that are the curse of our examination system; and that these may seize upon the innocent pupils and destroy their chance of a really successful life.

The only method of putting the science teaching of our universities on to a satisfactory footing is to appoint sufficient numbers of first-rate teachers, men who are keen researchers and can impart their enthusiasm to their classes: and they cannot carry out investigations if their routine work leaves them no leisure. Further, unless they are to be professors of pure mathematics, they must have a laboratory training. For men who teach physics on its qualitative or experimental side this condition is universally accepted, but if it is to be taught on the quantitative side this is just as necessary. To attempt to shuffle out of the obligation by re-labelling the subject as applied mathematics is dishonest: and it has not even the merit of being good policy. For it gives you a man whose natural field for research work is barred to him: he is not familiar enough with current experimental work to apply mathematical methods to it.

It would be idle to contend that the initial cost of efficiency will not be large; but the

importance of the issue is enormous, and there can be no doubt that the expenditure would ultimately be remunerative. Let us consider wheat-growing as an example. Before the war an acre of wheat in England yielded about twenty-three maunds, but in India about eight maunds. In view of recent research work, however, it would appear not impossible to improve the Indian yield by two maunds an acre, after which it would still not be half what is obtained in England. But the value of each additional maund an acre is fifteen crores of rupees, so that the extra two maunds would sell annually for a sum three times the total present expenditure on public instruction in British India, including universities and schools.

The improvement of sugar is another possible object. India has about $2\frac{1}{2}$ million acres of which each on the average produces about 1.1 ton of gur, equivalent to 0.4 of a ton of refined sugar. In Java the output is about four times as great; but in the Sandwich Islands they obtain from 6 to 12 tons of sugar an acre—something like twenty times as much as in this country. Considering the varieties of soil and climate in India, it would appear that a considerable improvement could be made here during the next twenty years. In a similar way the revenues from the forests of India which at present average only $1\frac{1}{3}$ annas an acre are worth fifty times this amount in some parts of the country and are obviously capable of large growth. Whether we look to the older industries or to the newer commercial ones, we find indications of great rewards for research work.

It may occur to those of you who are interested in the general problems of administration, that while the experimental methods which have revolutionized science have much to say in connection with agriculture or manufacturing processes, they have little to do with the problems that arise when studying the general welfare of

a province or the success of a large business. Now the essence of the experimental method is that instead of basing our explanations of phenomena on our faulty intuitions we base them on and test them by definite observations. But this method is capable of very wide application. If we were interested in such a question as the effect of temperature on plague, we should find it extremely difficult and costly to institute special direct experiments on the subject; but Nature has been making experiments for us for centuries, and there is no reason why we should ignore her work because we have not organized and paid for it. If we have fairly reliable data for thirty or forty years regarding our question, it is obvious that there should be material enough to settle it, and the only point at issue is how this is to be done.

Now quite simple considerations lead us to the idea of the correlation co-efficient between two quantities as the extent to which the variations of each are determined by those of the other. If we have a number of bags of rupees made of various light materials, the variations of the weights of the bags will be almost entirely governed by the numbers of rupees inside, and the correlation between the weight of a bag and the number of rupees inside will be almost exactly +1. Similarly the percentage of members of our Congress who are ladies added to the percentage who are men must make 100; hence the correlation co-efficient between these two percentages must be exactly -1. On the other hand, if the variations of one quantity have very little dependence on those of another, such as the cost of a book and its literary merit, the correlation co-efficient will be small.

I propose now to give you a general idea of the method of statistics by looking at some of its applications, and first of all will put before you the problem that led me to work at the method. You will see on the screen the average winds of July, showing

that our rain-bearing monsoon winds come from the South Indian Ocean and must therefore be affected by conditions over a large part of the earth's surface. The upper pair of curves now before you* illustrates the formula worked out in 1908 for forecasting the whole monsoon rainfall of India. The formula, being based mainly on the data from 1876 to 1908, agrees fairly well with the actual rainfall during that period; but the indications given by it for the nine years 1909 to 1917 afford us a perfectly satisfactory test of its value. The formula, as you will see, is in excess or defect with the actual, seven times out of nine.

Turning to the cold weather the forecast turns mainly on whether the season is severe or mild in December: for there are fairly long odds that it keeps through January and February the same character as it had in December. The line marked 'calculated' indicates for successive years the conditions in December in the extreme north of India, Persia, and Baluchistan as given by the rainfall; while the 'actual' gives the subsequent rainfall and snowfall of the winter as actually reported in North-West India. You will see that in most years the December conditions afford a correct indication of the ensuing months.

Let us now consider some agricultural applications. The dependence of crops on rainfall is in many countries so obvious that anybody with the least claim to a mathematical equipment ought to be able to work out for himself a formula for the crop in terms of the total rainfall; and the earliest case that I know of the application of statistical methods is the determination in 1874 by Governor Rawson of the sugar crop of Barbados from the rainfall. The curves before you† show the rainfall, the actual crop, and the crop as calculated by Rawson's formula. We may take as representing the modern method of determining what

affects a crop that employed by Hooker in 1907. We have on the screen* diagrams showing for wheat, oats, potatoes, and hay in the east of England the effect of rain, of accumulated temperature above 42°, and of accumulated temperature below 42°. The curves show the correlation co-efficients at intervals of four weeks for about eighteen months before the crop is harvested, and from these we may read off the conditions that bring success. For wheat they want a warm and dry first summer, autumn, and winter, with cold and wet in the final spring: a cold winter is bad. For oats it is vital to have heavy rainfall and deficient warmth in the spring and summer. For potatoes cold and rain in the first summer are good, not bad as for other crops. For hay nothing matters until the final spring, when wet and cool weather is essential. The correlation co-efficient of the hay outturn with these two factors jointly is 0·8, which means that an extremely good forecast is possible.

Last year I made a preliminary examination into the wheat, cotton, and jute crops of India, but found extreme shortness of the series of reliable data available to me a big handicap. The outcome, which is not very trustworthy, is before you,† and appears to show that important results may be expected from a more complete examination. If you look at the correlations for the Punjab rabi wheat crop you will see that it seems to be greatly affected by cloud, temperature, and humidity in March, as well as by rain in December and January. Taking the rainfall of the two earlier months we can derive a forecast of the probable crop, and the result of this is shown as the upper diagram on the screen.‡ By confining himself to single types of crop and a single district or assessment circle Mr. S. M. Jacob has got some striking results, and the middle and lowest diagrams indicate how well statistical

* See Plate I.

† See Plate II.

* See Plate III.

† See Plate IV.

‡ See Plate V.

formulae will fit the data for the past thirty years. The middle one shows how the area of well-irrigated wheat in the Dona Charhda assessment circle is related to the previous rainfall. Naturally if a peasant realizes that there has been rain enough to sow his wheat on unirrigated land he sows it there, and the area sown on well-irrigated land is diminished. The lowest curve gives the actual area compared with the area as deduced from the rainfall.

We may now turn to America where the Agricultural Department have been most energetic and successful in work of this kind. As an example I have taken the Georgia cotton crop which is largely dependent on temperature in May and June. The diagram* shows how a forecast may be based on this. When the process of ginning is actually going on they are still anxious to know what the total crop will be: and the lower diagram illustrates how this may be obtained from the amount of cotton actually ginned between the 1st September and the 14th November and the number of fair days in that interval.

So far our methods have been quite easy to interpret, and there is little room for controversy as long as purely mathematical conditions are satisfied. It is when we come to economical or sanitary questions that difficulties arise, especially if the data are not reliable or do not cover a long series of years. For we may find that events A tend to be associated with events B; but this does not prove that A causes B or that B causes A: for both of them may be due to some third series of events C. I will illustrate this by showing you two curves. The top-most on the screen† gives the proportion of those in England who when married cannot write and put a mark on the register instead of a signature. The second curve gives the amount of unemployment in England: actually it indicates the total expenditure by trades unions on their unemployed members.

At first sight it would therefore appear that there is a very intimate and reliable relation between illiteracy and unemployment, the more ignorant the people the less being the unemployment. But we cannot conclude that A causes B until we have satisfied ourselves that no third factor C dominates the situation. One factor which seems most likely to influence the proportion of illiterate married people is the number of marriages, for the rate at which educated people marry will presumably not vary very greatly from year to year: and the factor which may be expected to have most influence on unemployment is the amount of trade. I am accordingly giving you as the fourth curve on the screen the fluctuations in the marriage rate, and as the third the fluctuations in the sum of exports and imports per head. It is now quite clear that the prosperity of the country is the dominating factor. When trade is good unemployment is small: at the same time weddings are numerous especially among the working classes, and hence the proportion of those who can only put a mark in the marriage register will be large. In text-books of statistics there are definite types of relationship which are called spurious, but the necessary and sufficient way of avoiding all these pitfalls and securing a right result is to consider all the factors which can produce an appreciable influence.

Among the most interesting and important Indian problems to which statistical methods can be applied are those of the health and prosperity of its races, and I will sketch an attempt that I made recently to throw light on conditions in Bengal. The data of births, deaths, and diseases there are recorded by chowkidars and are officially admitted to be decidedly inaccurate: at the same time it is easy to see that, if two series of quantities are related and we make random errors in recording them, the two inaccurate series so derived will in general be related almost as clearly as the original series. Hence there

* See Plate VI.

† See Plate VII.

is hope that these vital statistics, though inaccurate, will yield results which are true qualitatively though perhaps not quantitatively.

A student of Bengal data finds himself brought up at the outset by what seems an insurmountable barrier to progress. The registration by the village chowkidars seems so bad that over Bengal each of them reports the same number of deaths irrespective of what has really happened. This, at least at first sight,* appears to be the only interpretation that can be put on the close relation between the death-rate and the number of chowkidars per 10,000 of the population. But even if the work is badly done why should this relation hold? Our suspicions are thereby roused, and if in obedience to the principle just laid down we think what other factors may be involved we soon hit on the explanation. The obvious factor to examine is that of population: a big death-rate means that the ratio of the population, say, ten or twenty years ago to that of today is high. If the number of chowkidars per 10,000 is also high in these cases, it means that for the areas in which the population of, say, twenty or thirty years ago was high the number of chowkidar posts also was high. In other words, when the numbers of the chowkidar posts were last revised they were made roughly proportional to the population of the time; and this, I am told, is what happened. The lowest curve on the screen gives the ratio of the population of 1881 to that of 1911. It could not be expected that this would agree perfectly with either curve, but I think it supports the interpretation.

As it is better for these purposes to have a fairly uniform area I have taken for consideration that of South-West Bengal, *i.e.*, the Burdwan and Presidency Divisions. I will not trouble you with the details of the processes employed, but will put on the

screen* the curves showing the factors which seem to have most influence on the fever rate of any year. They are—

- (1) the population at the beginning of the year,
- (2) the cost of rice in the previous year,
- (3) the area under cultivation in the actual year,
- (4) the rainfall in the actual year.

The table of relations between these is:

	Fever	Population	Cost of rice	Cultivated area	Rainfall
Fever ...	+1'00	+0'55	—0'35	—0'40	—0'20
Population ...	+0'55	+1'00	—0'65	0'00	+0'10?
Cost of rice ...	—0'35	—0'65	+1'00	+0'15?	+0'10?
Cultivated area ...	—0'40	0'00	+0'15?	+1'00	+0'40
Rainfall...	—0'20	+0'10?	+0'10?	+0'40	+1'00

Of these the probable error due to pure chance is about 0'13, so I have only given the figures to the nearest 0'05, and those less than 0'2 are certainly doubtful. From these we can find by simple algebra the following 'regression' equation between the departures from their average values of these quantities

(fever) = 0'65 (population) + 0'15 (cost of rice) — 3'35 (cultivated area) — 0'15 (rainfall): here by writing any quantity, such as (fever), within brackets we mean that we take the departure of the fever rate from the average and divide it by the mean departure of fever rate. Let us first look at the largest and therefore most reliable figures in the table. First, the —0'65 suggests that a rise in the price of food in any year has a marked effect in diminishing the population at the end of that year: as we shall see later only a part of this is due to the usual struggle for existence.

* See Plate VIII.

* See Plate IX.

The $+0.55$ shows that an increase of population at the beginning of a year tends strongly to be followed by an increase of the fever rate during that year: this is a rather striking result, and we shall examine it shortly. The -0.40 shows that an increase of the area under cultivation means a decrease in the quantity of fever: this is presumably because the processes of cultivating the land leave fewer pools long stagnant for mosquitoes to breed in. The $+0.40$ presumably means that when rainfall in any year is scanty the peasant does not cultivate as much land as when there is plenty of rain for his crops. Let us now look with some care at the -0.35 which informs us of a decrease in fever next year due to an increase in the cost of food this year. At first sight this result is surprising, for we should expect that less rice to eat this year would lower vitality and so increase fever next year, not decrease it. But the explanation is easy and important. The -0.35 tells us of the actual effect of the cost of rice on fever rate, and so includes indirect as well as direct effects. We have just seen that it has a big effect in decreasing the population, and that a decrease of population produces a decrease of fever. This large indirect decrease would be enough to swamp a small direct increase; further, the decrease may be emphasized by the diminution in fever due to the slight increase in cultivation (of amount $+0.15$?) caused by higher prices for rice. The regression equation shows us in exact terms that this general reasoning is correct. It gives us the departure in fever produced by departures in the other variables separately, and when the indirect effects of the cost of rice are in this way included in their proper places, the direct effect of an increase in the cost of rice is a small increase in the fever rate.

I have discussed these relations at some length because I wish to make it clear that though the ordinary correlation co-efficient is very often treated as if it gave the direct

effect of one factor on another, it frequently does nothing of the kind: and it always gives the total effect, direct and indirect. We cannot get the direct effect except by forming the regression equation of the type that we have just considered: and we may get misleading results unless that equation contains all the factors which produce appreciable effects. It will be remembered that there was a co-efficient of -0.65 between the cost of rice in any year and the population at the end of it: this relationship which is shown on the screen* seems at first sight so close as to suggest that the population must be in dire poverty. But if this conclusion were justified we should equally infer from the close relationship in England between the number married and the trade activity that the young people there were as anxious to get wedded as a starving man is for his food, a state of things which does not fit with a declining birth-rate. As a matter of fact the high price in any year has a relationship of -0.35 with the increase of population in that year, but -0.65 with that in the previous year: these relations are shown on the screen. Thus, if we can trust our data, the association of high prices in any year with low population at the end of that year is mainly brought about in the previous year, and the high prices are chiefly a result, not the cause.

The remaining close association, that whereby an increase of population produces an increase of fever, is now put before you.† It is so directly opposed to widely accepted medical ideas that for some months I did not treat it seriously. But on my informing Major McKendrick of Kasauli of it he urged me not to reject it lightly, and drew my attention to some analysis of his which would suggest an explanation. I have therefore examined the corresponding relationship for all the ten provinces of India for which sufficient data are available, and have only found

* See Plate X.

† See Plate XI.

one negative co-efficient. The average value is +0.5. For those of you who are interested in sanitary matters I may briefly explain that the spread of malaria among men depends on the meeting of healthy men with infected mosquitoes, and the spread among mosquitoes on the encounters between infected men and healthy mosquitoes: hence the relations are symmetrical from the mathematical if not the æsthetic standpoint, and an increase in the number of men has essentially the same bad effect as an increase in the number of mosquitoes.

The conditions in the drier regions of India are so different from those of Bengal that it would clearly be dangerous to argue from one to the other; and this year's malaria has drawn attention to the work of Major Christopher's seven years ago. He then published data for malaria in the Punjab as affected by prices and rainfall, noting that malaria went up with excess of rain or a rise of cost of wheat in the same year, and with a defect of rain in the previous year. His work was most important though he did not separate the direct from the indirect effects, and his numerical results and mine differ somewhat.

Taking his data without modification I have worked out the table which is put on the screen.

Correlation co-efficients.

	Fever	Rainfall same year	Rainfall previous year	Prices same year
Fever mortality ...	+1.00	+0.55	-0.30	+0.45
Rainfall, same year	+0.55	+1.00	-0.05	+0.10
Rainfall, previous year ...	-0.30	-0.05	+1.00	-0.40
Price of wheat, same year ...	+0.45	+0.10	-0.40	+1.00

Here the probable errors vary from 0.07 to 0.1, and I find (fever)=0.5 (rain of same year)-0.15 (rain of previous year) +0.35 (prices).

So the direct effect of rain in the previous year appears practically negligible, and its

effect is brought about through a rise of prices.

I have deliberately given you several examples in which a superficial treatment by statistical methods leads to an entirely wrong conclusion: and it is owing to such possibilities that the remark is so glibly made by the general public that by statistics you can prove anything and that the method is not practical. But it appears to me obvious that we have every right to be misled if we trust a man's application of statistics to a problem, say, in economics, if he is not familiar both with statistical methods and with the principles of economics. If you build a big bridge you call in a man who understands the calculation of stresses and strains as well as the methods of handling steel: and only when you have done that have you a right to expect success. Further, although he makes calculations you don't dismiss him for being unpractical, because everybody knows that mechanical problems have been solved by mathematical processes for a century or more. But by your self-restraint you do not forfeit the right, which long custom has given to all of us, to call any method unpractical either if it is not purely rule of thumb, or if it is in the slightest degree difficult to understand, or, most important of all, if it is new. As Huxley remarked, the practical man is the man who practises the errors of his forefathers.

I hope that statistical methods may before long be recognized as essential for efficiency for the following reasons. First, a table of data covering, say, fifty years gives any intelligent man the same advantage as if he had carefully watched the conditions for fifty years and had a perfect memory: secondly, employing a draughtsman to plot these data will suggest relationships in a manner which would otherwise require profound study of the figures: and thirdly, employing a clerk to work out the correlation co-efficients and regression equation will give him without effort reliable information about their relationships which will distinguish direct from indirect effects, and could be got in no other way.

In conclusion I would urge on those of you who have any control over the collection of statistics to exercise all the care within your power in order to secure accuracy, and so by laying up invaluable materials for their use to deserve the gratitude of posterity.

PLATE I.

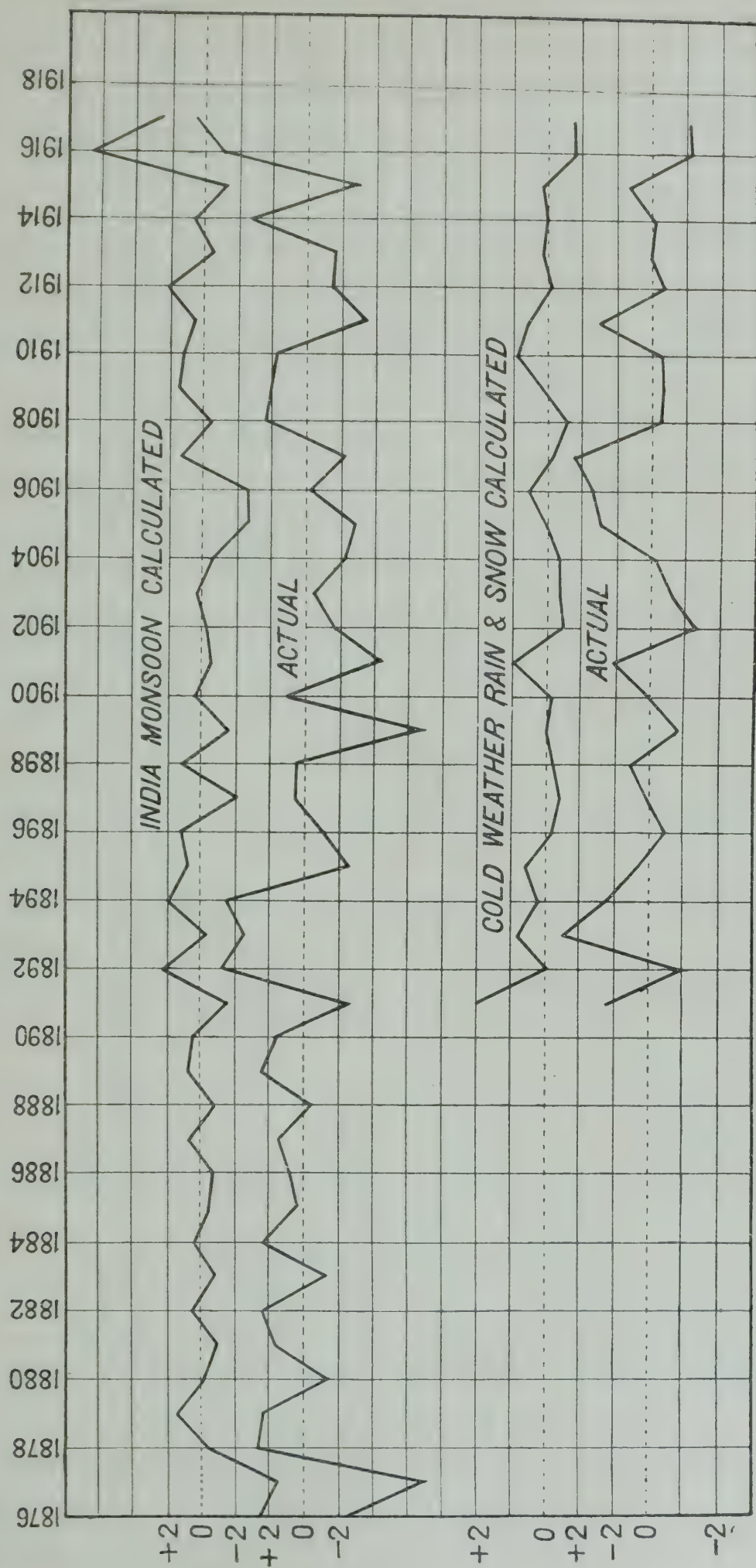
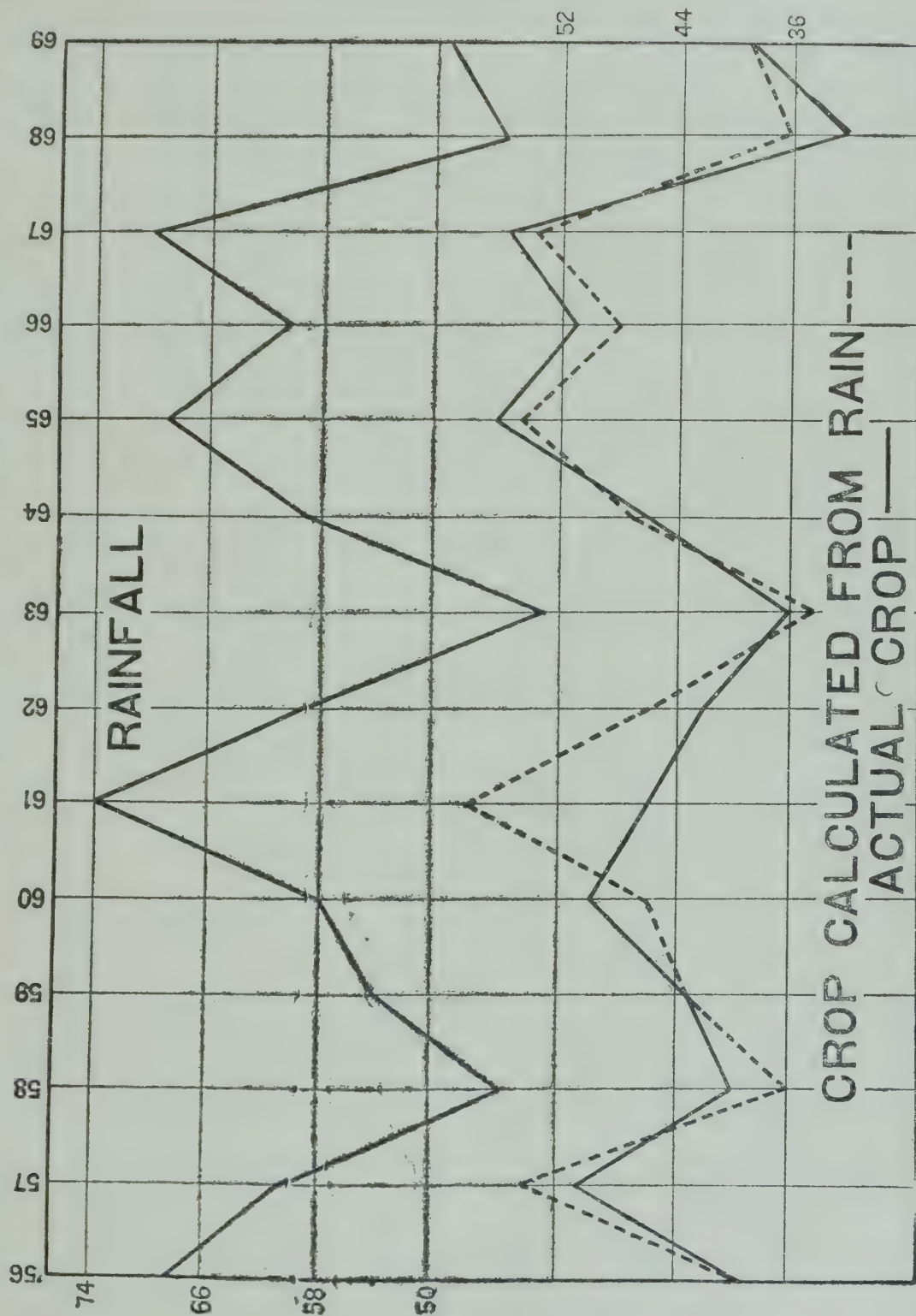
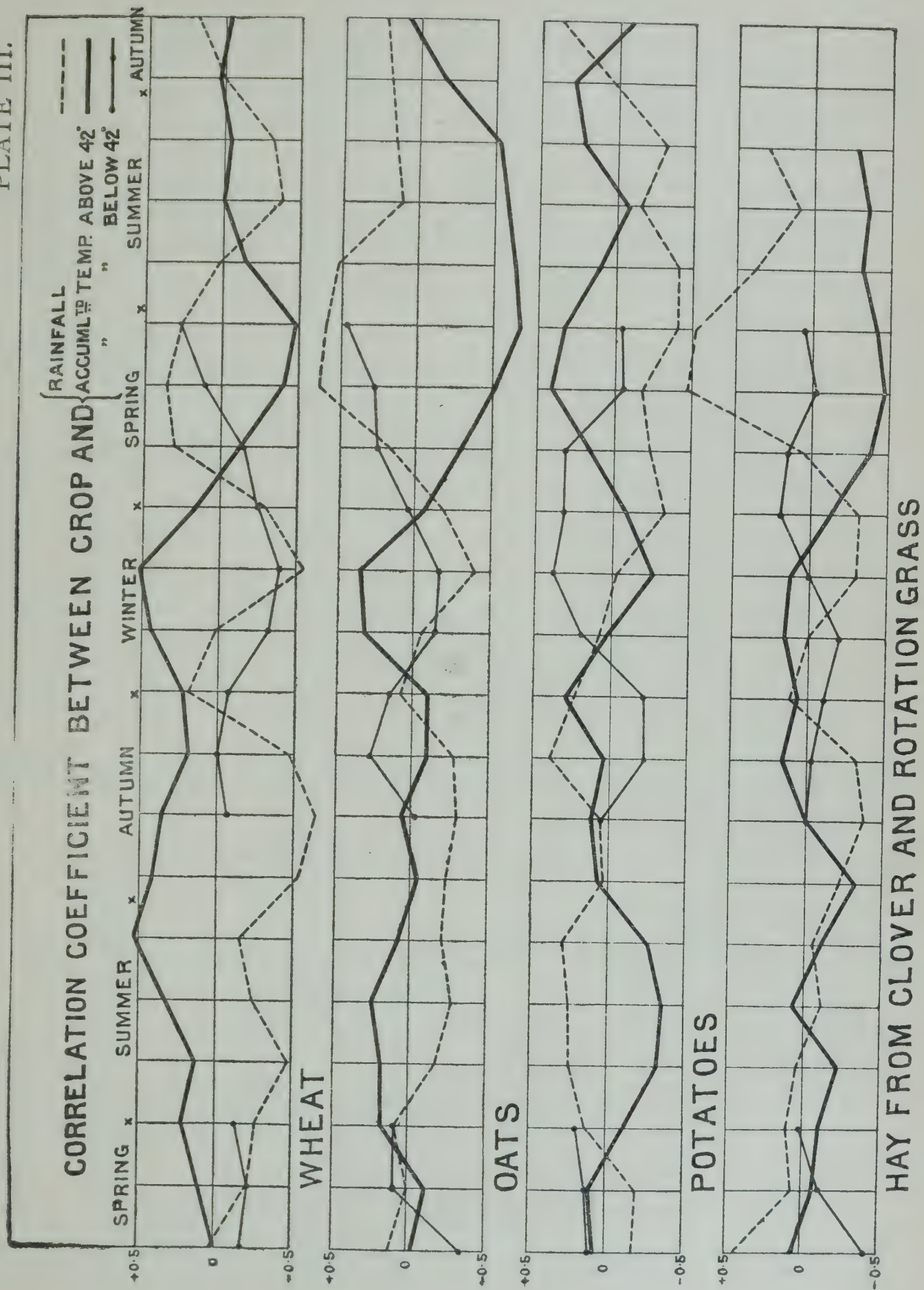
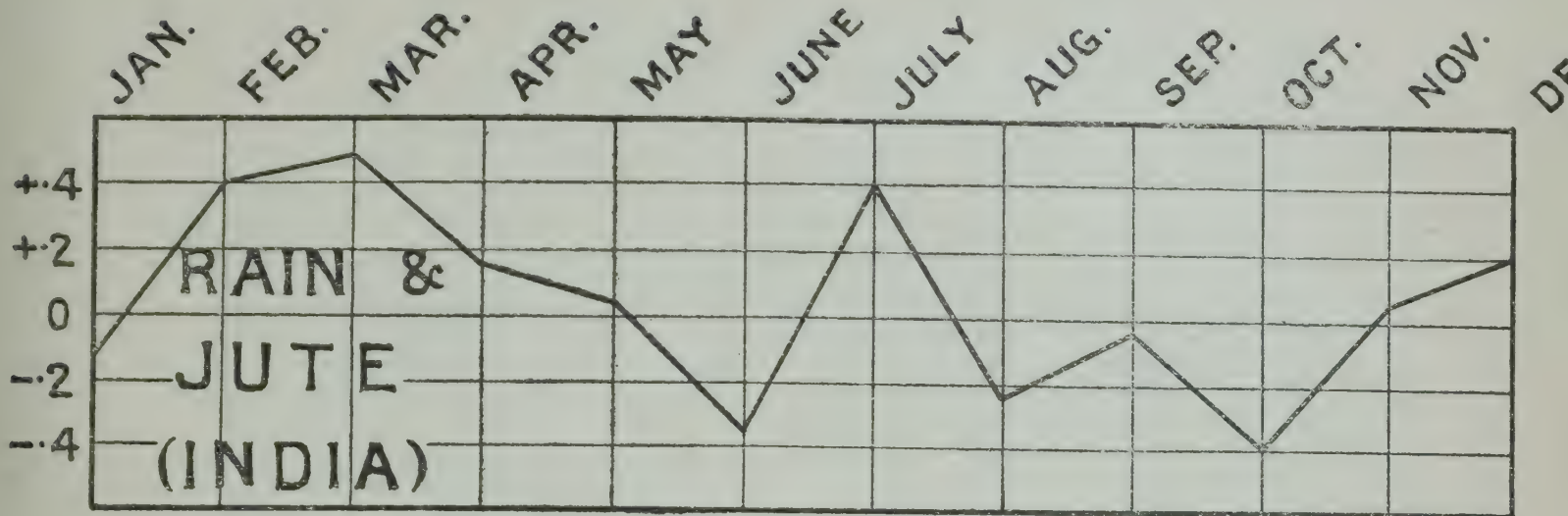


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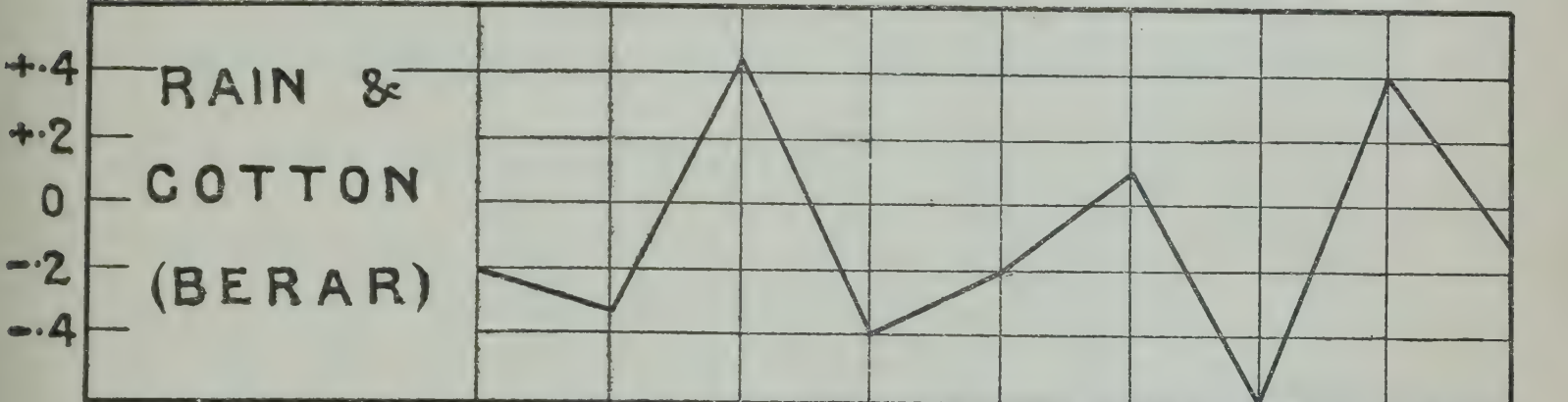
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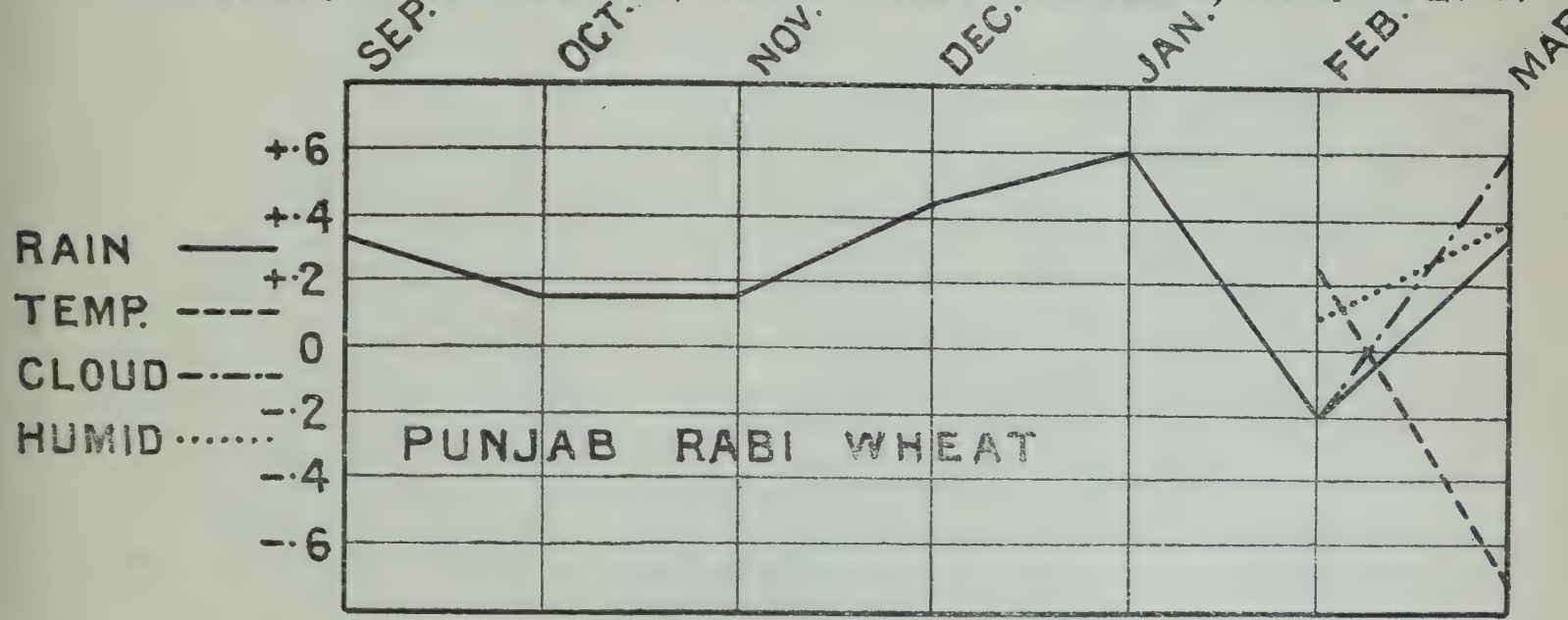




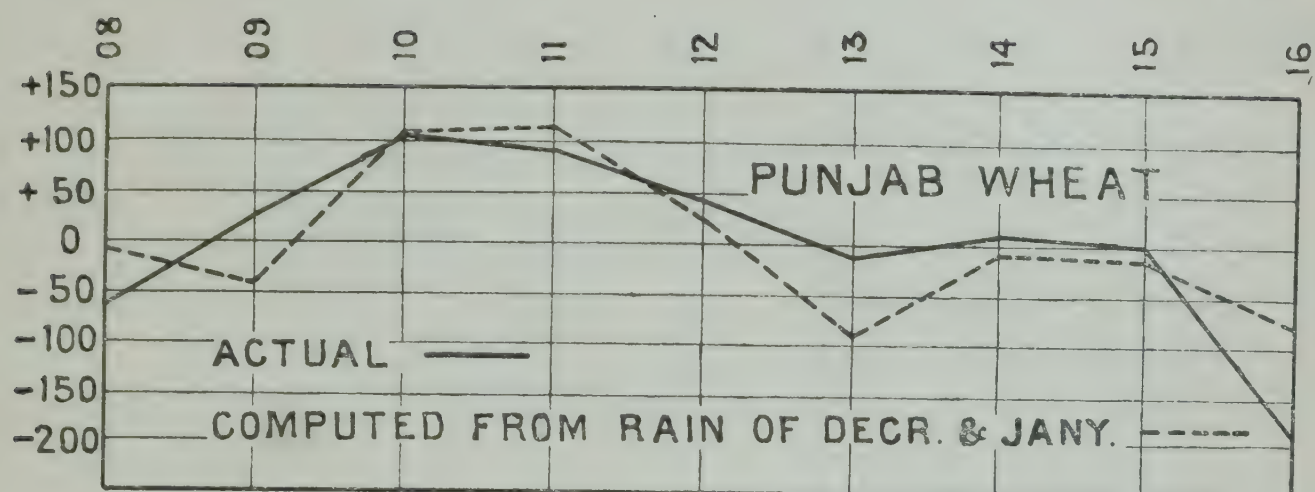
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WEEDED, JUNE - SEPT: HARVESTED, JAN - FEB.



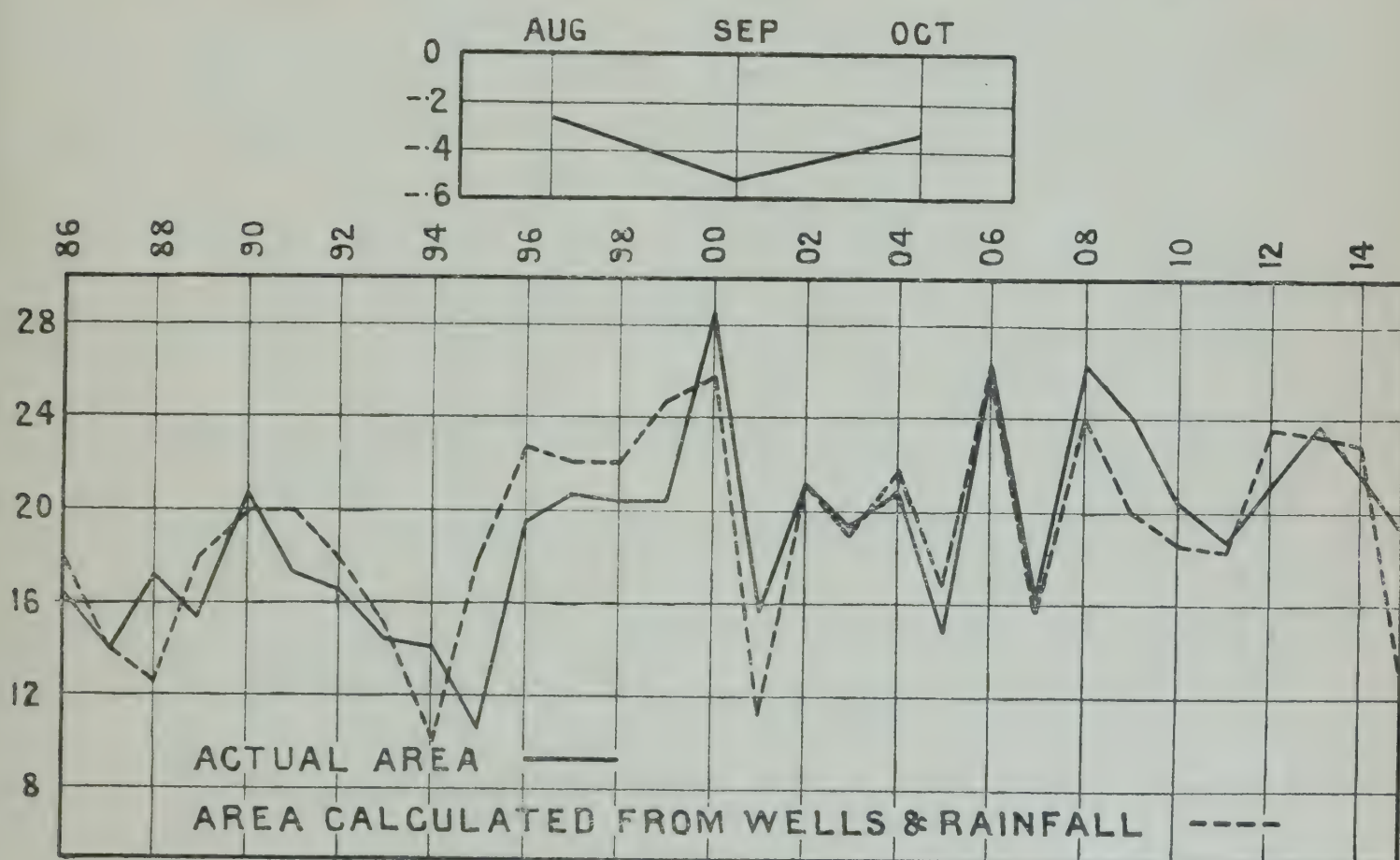
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SOWN, OCT - NOV: HARVESTED, MARCH - APRIL



WELL-IRRIGATED WHEAT: DONA CHARHDA CIRCLE.



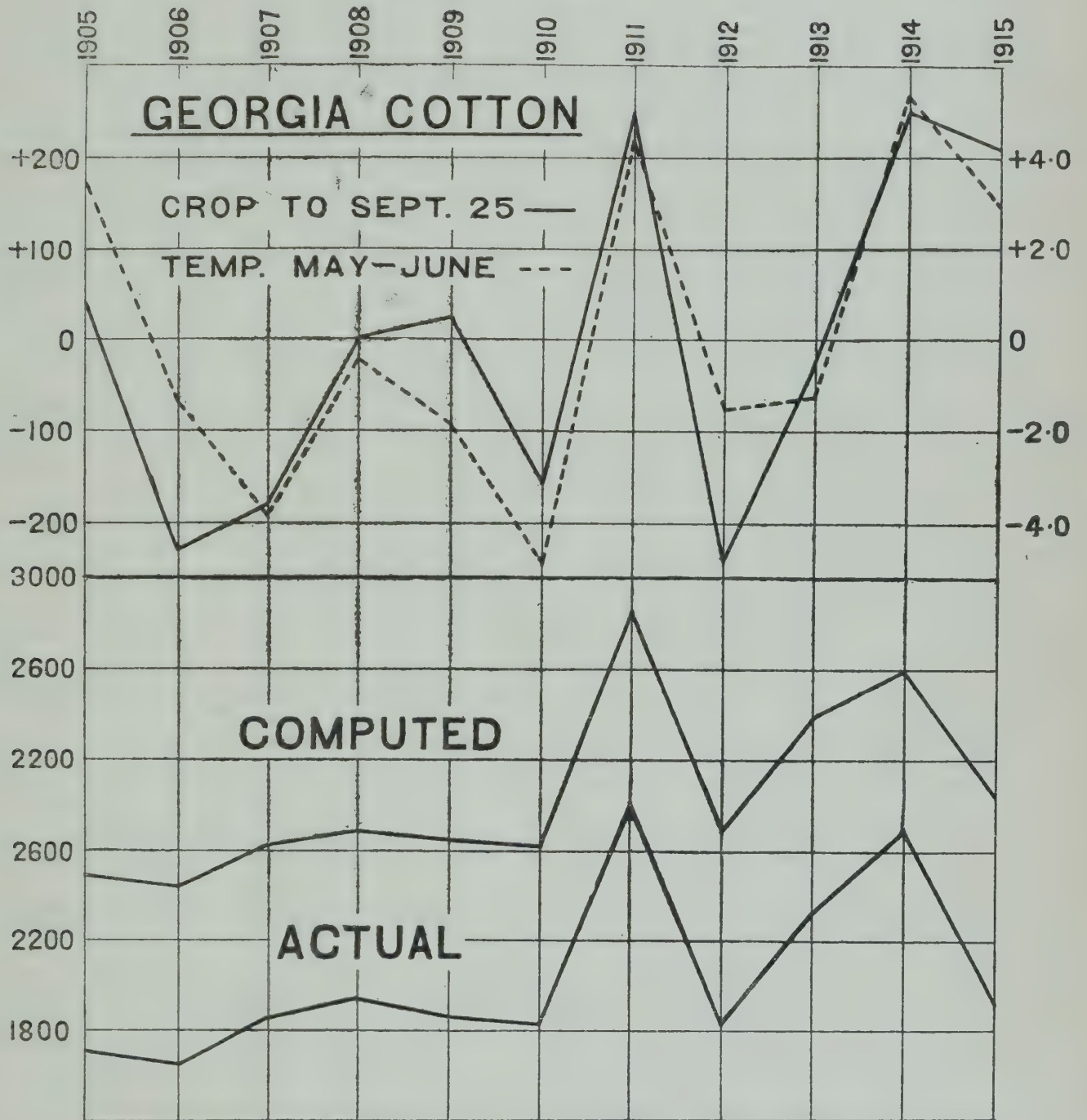
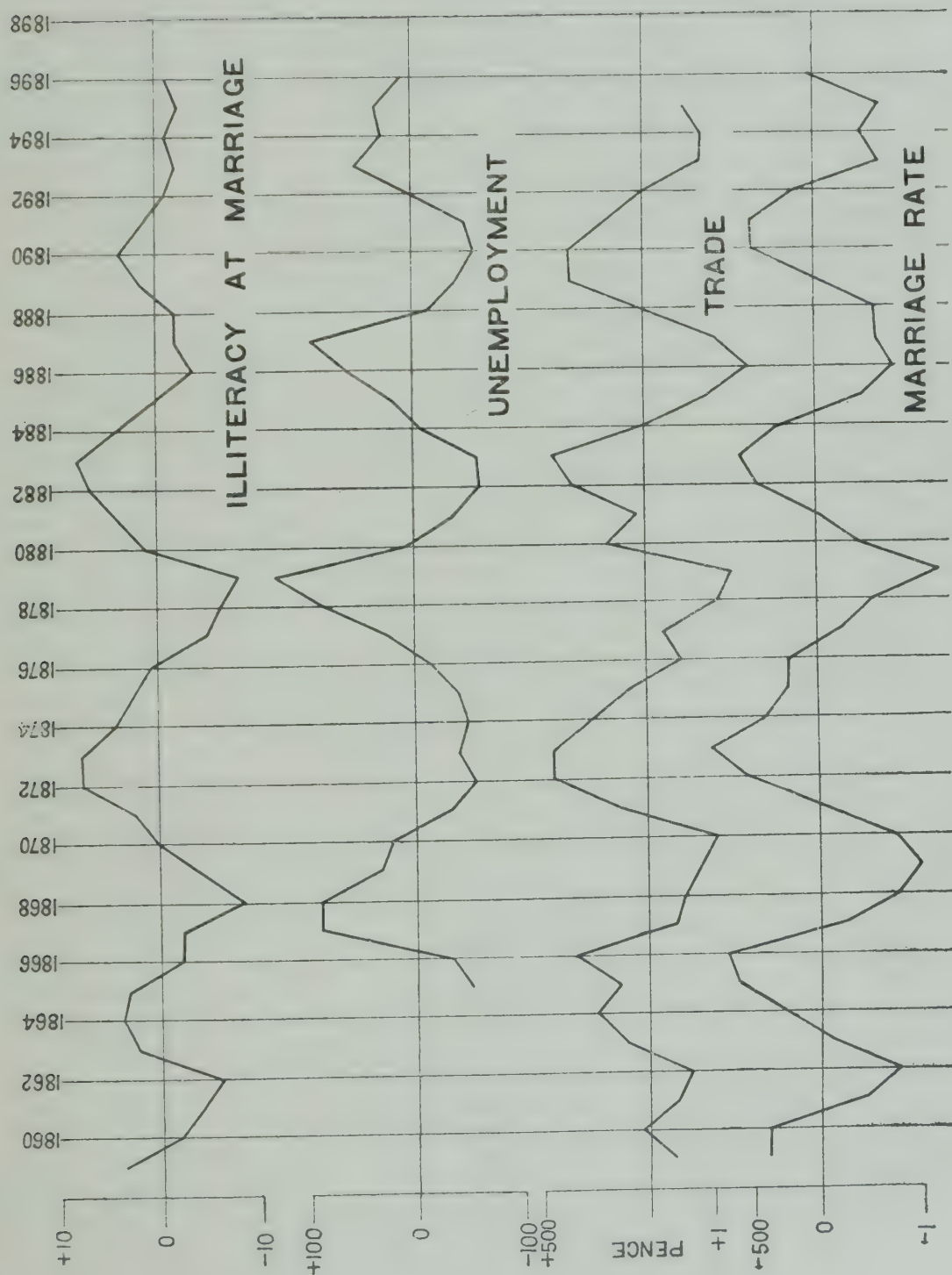
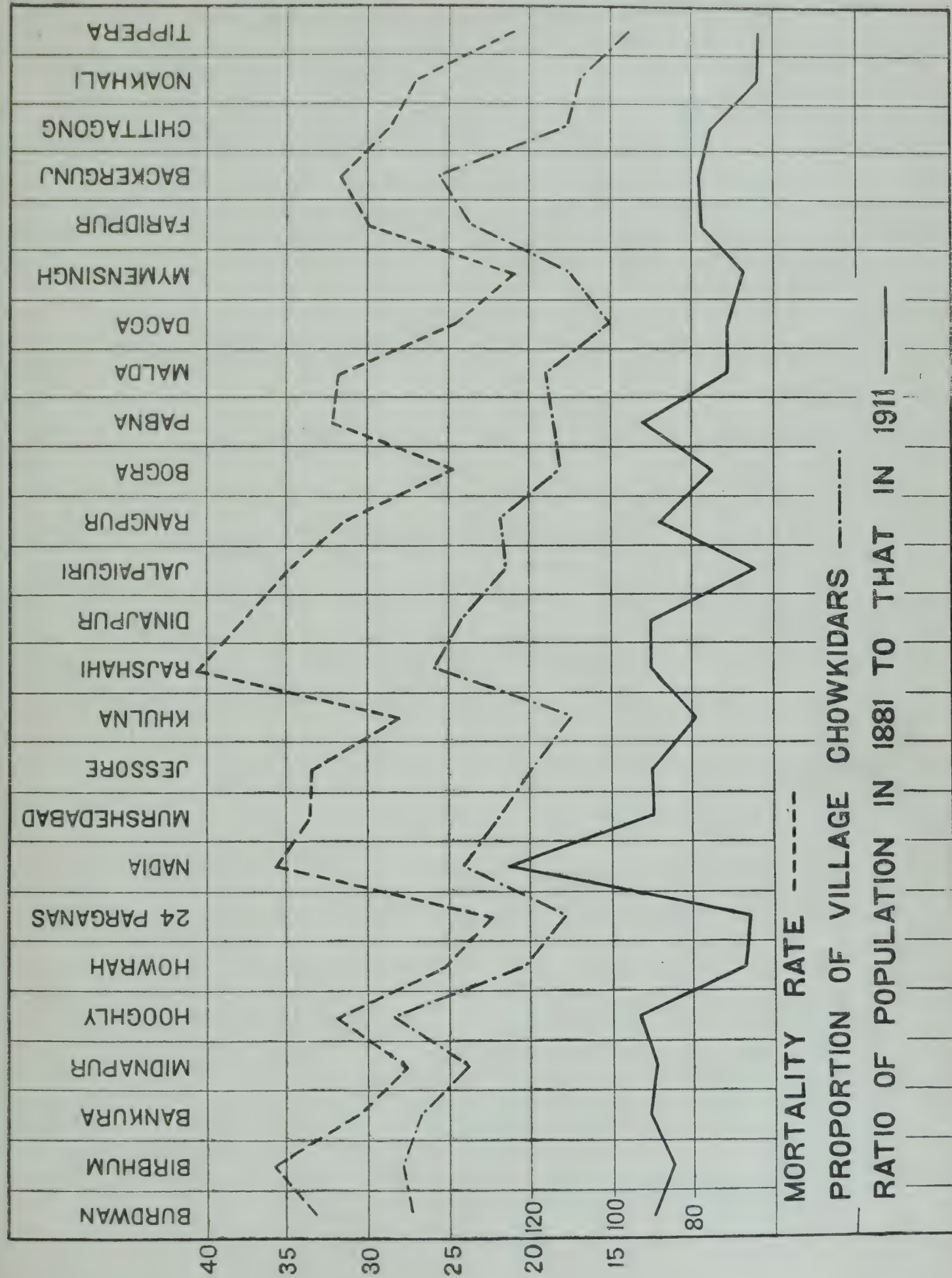
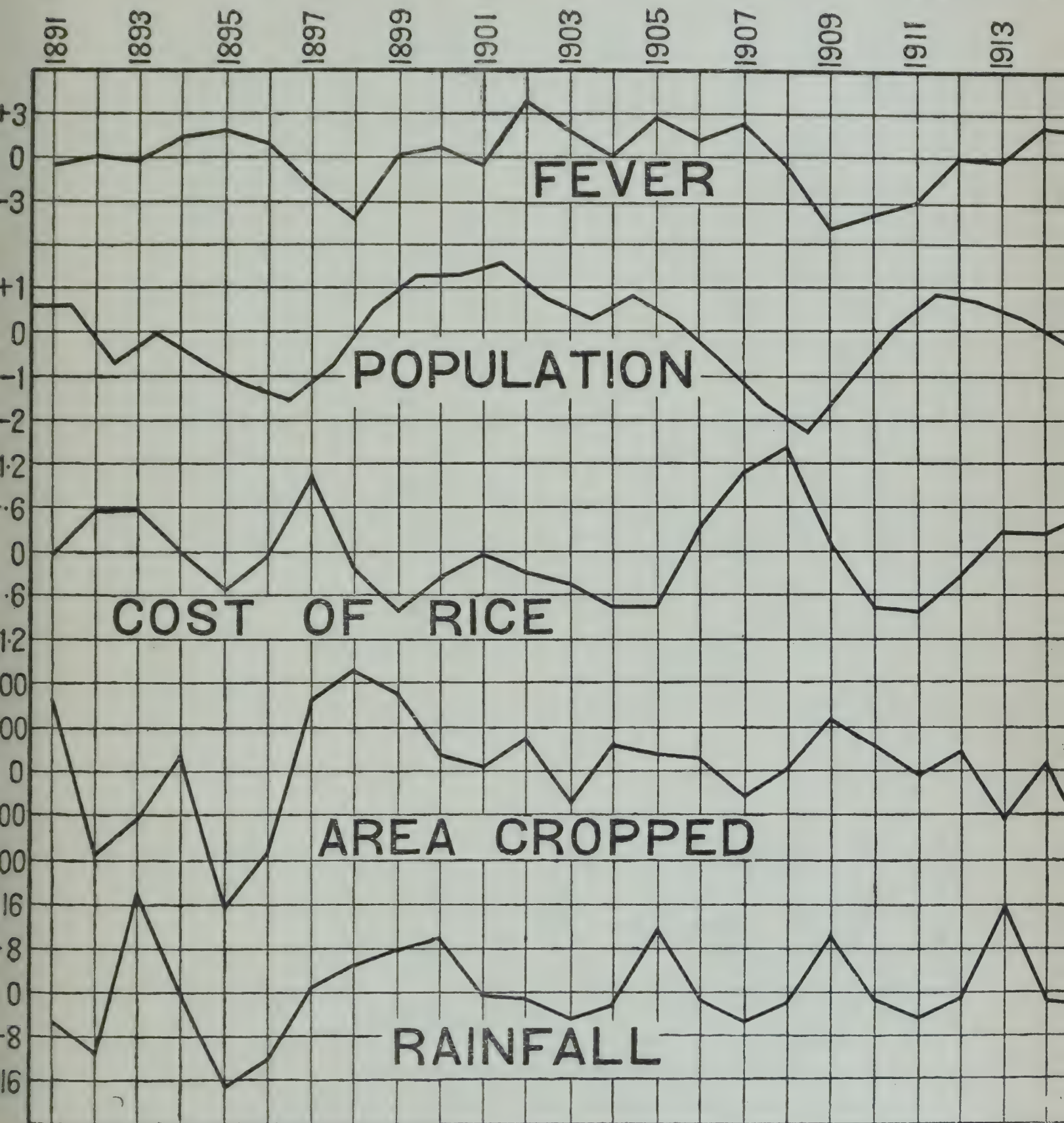
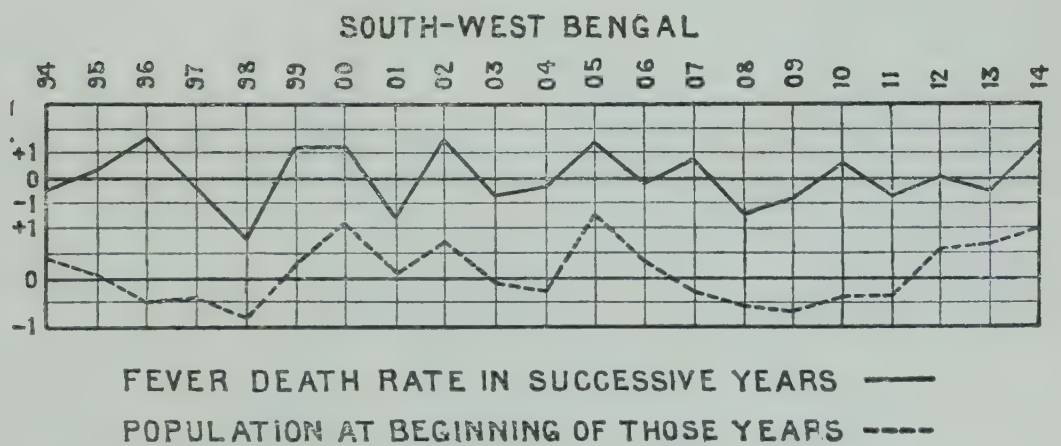
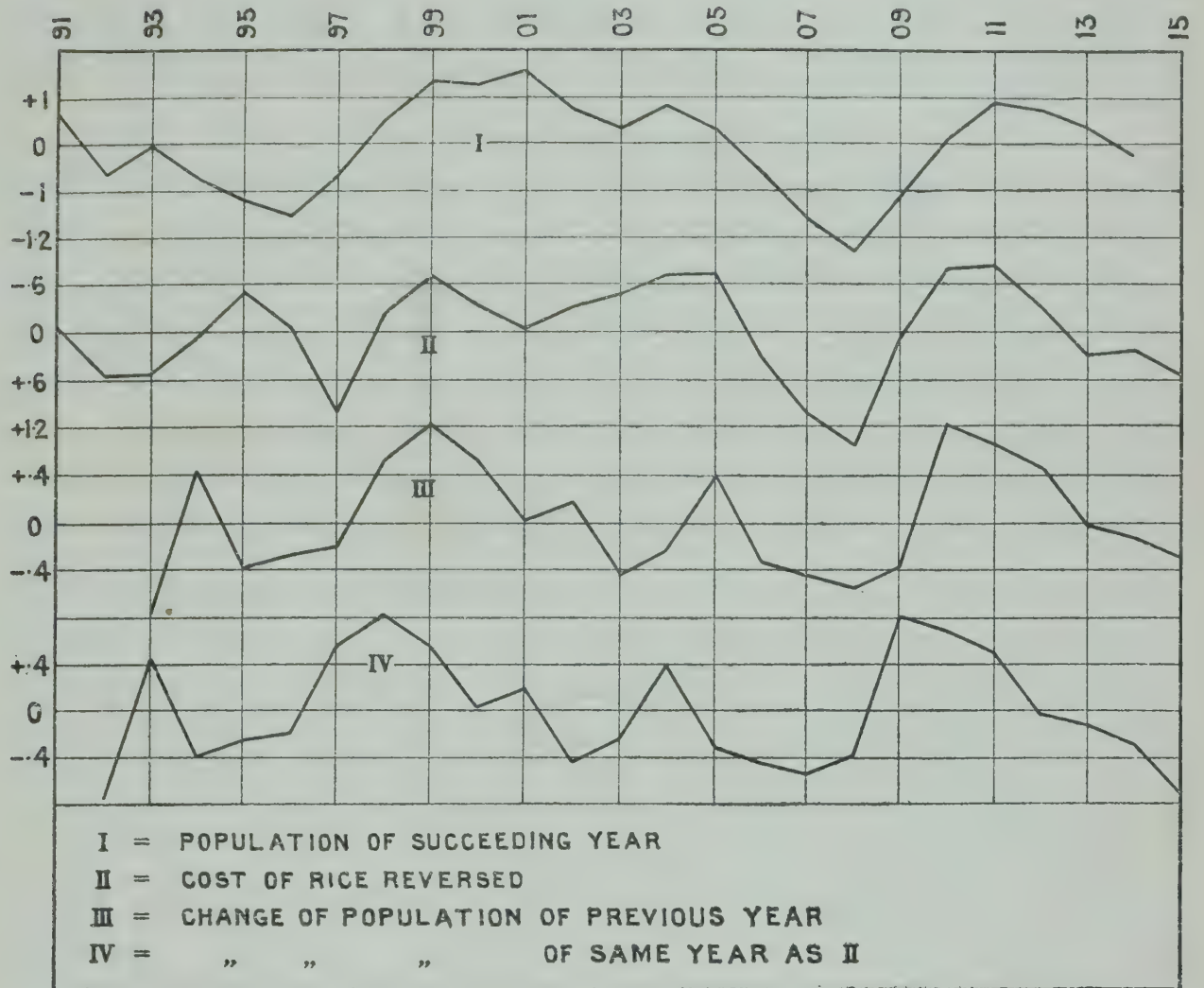


PLATE VII.









HOW TO GET ON: THE BEST METHODS.

BY THOMAS J. BARRATT,

Chairman and Managing Director, Pear's Soap Company.

IT is a mistake to think that good qualities alone will enable a man to prosper. Thoreau, long ago, dreamer though he was, saw through the insufficiency of this gospel of goodness as an equipment for success in a world of struggle and practicality. "Be not merely good," he said, "be good for something." To maintain this is in no sense to depreciate goodness or any of its component elements; but over and above the cardinal virtues—if ever any man was saint enough to possess them all—for success there must be present in a man's nature a forcefulness of character, a capacity for forging ahead, and a persistency of purpose that can surmount obstacles and make rough places smooth.

To express the idea in familiar colloquial phrase, to "get on" one must have the power and aptitude for "tackling" things. And what a concentration of energising activities this gift of tackling things comprises! Determination, a properly balanced aggressiveness, quickness of perception and decision, and a general directness of speech and action which takes the shortest cut to its object; all these are more or less a necessity to the equipment of the man who wants to "get on," and, fortunately, most of the qualities are not beyond cultivation.

Success, however, is a matter of degree and ambition. Only the few arrive at the mountain top—the men with special equipment—but there are plenty of midway pleasaunces of scope sufficient to satisfy the aspirations of the ordinary mind. Success may be said to have been won by whomsoever raises himself to a noticeable altitude above his starting point. It is success for a clerk to

raise himself to the position of manager; for a common seaman to press himself forward to a skippership; for a railway porter to work up to the post of station-master; and something of the same qualities of mind and character as go to the making of the higher successes are necessary to the winning of more moderate triumphs.

HEALTH AND BRAINS.

These two essentials come by nature, but are strengthened and expanded by cultivation. Many a fragile frame has been safeguarded and tended to a condition of strength by good sense and care—the strenuous Roosevelt, for instance; while in regard to brain it does not cease to grow until senility sets in. Physical health and mental power are so closely allied that only in abnormal cases are they dissociated. But, with Juvenal's oft-quoted "mens sana in corpore sano" realised, or as near as may be, the process of success-equipment can go merrily forward, for, as has been well said, "If a healthy body contributes to the health of the mind, so also a healthy mind keeps the body well." Both body and mind have to be exercised into efficiency, or stagnation of the one and apathy in the other will follow, and, as Shakespeare says, "Your dull ass will not mend his pace by beating."

Knowledge and experience are the feeders of the brain. All the school knowledge that can be obtained should be taken advantage of, or the coming days will be saddened by regrets over lost opportunities. But so much of our school knowledge is a matter of rule and rote, and insufficiently memorised, that it must be backed up and eked out by an unwearying effort to add to the stock from every proper source—especially by constant courses in the college of experience. By resolving to learn something new and useful every day, however, by cultivating an inquiring habit of mind, and by practising one's powers of observation until the faculty of seeing the practical side of things is developed, the equipment of knowledge soon

grows to goodly proportions. It is what you observe that tells.

"Two prisoners looked from the prison windows. One saw the stars, the other the mud."

Always look above the mud. Among the lessons one learns in life's course, those of adversity have been said to be sweet, but the fewer lessons one takes in this direction the better. Adversity never lingers long with the man who has in him the makings of success.

SUCCESS-ABILITIES.

Briefly, I think, these may be brought into some such classification as the following: Cap-ability, work-ability, respons-ibility, adapt-ability, and practic-ability. If you examine these, you will find that there has not been much left out. Of these only one need detain us, and that is Work. The others explain themselves, and are partly dependent upon circumstances. Work-ability is the bravest item in a man's equipment for "getting on" in business. The founder of the house of Rothschild, who propounded many business maxims for the guidance of his successors, wound up the lot with this injunction: "Follow these, then work hard, and you will be certain to succeed." Thinking, however, is the chief part of work, from nearly every standpoint. Even the hardest physical labour is eased when thought accompanies it; for the stroke of a mattock, the blow of a hammer, or the trundling of a wheelbarrow, when guided by thought as well as by bodily strength, has its labour-strain lightened and relaxed; and the man who thinks over his manual labour will almost be sure one day or other to work himself up to a better level.

In the course of my own experience I have seen a great change in the methods of working, in offices as well as in works of construction, and all this is the result of thought. In all directions labour-saving contrivances are being multiplied, and mechanism is superseding the struggle of the hands. This thought-working is the achiev-

ing power in these days, and although there must always be, in the metaphorical scriptural phrase, "Hewers of wood and drawers of water," the number must diminish year by year, and those who think the most and the best will succeed the best. Still, in the work of our workshops and offices much remains to be done before anything approaching an ideal condition can be reached.

THE WORKING CONSCIENCE.

Many are wanting in what I may call the "working conscience,"—that is, the natural, inborn stimulus for work. There are still men so little afraid of work that they even dare to go to sleep beside it, or at least allow themselves to lapse into a half-slumberous condition, when superintendence is not active and insistent. There are still youths who regard "shutting up shop" as the main thing to desire, and who believe that the true work-a-day motto is "Labour as little as possible and get as much as possible for it." But these are the people who stick in the ruts and do not "get on." There is another motto that is much better worth keeping in mind and that is "There is no fun like work." It is an axiom of an old friend of mine, the creator of an enterprise of world-wide repute, Sir Thomas Lipton. What he means is that to work well and take an interest in what you are doing makes the hours pass pleasantly and profitably; whereas, to the come-day-go-day idler, who shirks and yawns and is for ever glancing at the clock and wishing the day was over, minutes seem like hours; he lives in an atmosphere of drag and lag, and should in the familiar phrase either "get on or get out."

The "wait and see" policy—the policy of Micawber—is not one to recommend to the "getting on" aspirant. "Find out" is a better. In some rural districts that I know, "Find out," is a common rejoinder to anyone who asks how a thing is to be done. It is astonishing how much knowledge can be acquired, and how much the sense of

responsibility can be quickened, by this simple plan of finding out things for yourself. Revelations await you at every stage. The young man who does things without wasting time in asking or waiting for help is soon recognised as of the "getting on" type, and is rewarded with advancement. Such people, as a rule, go far and fare well; for when opportunities lag they go farther forth and find them.

APPLICATION.

Once having acquired or got into line with the right sort of equipment, there is still the lesson of its application to learn. Knowledge, without the power to use it, is of little avail; capability that does not shape itself for action has nothing to exercise itself upon; the will and the desire to make them operative must be there or little success will result. Still, whatever you do or omit doing, never forget the time-honoured virtues hallowed by a thousand inspiring memories. Sometimes they are voted old-fashioned, but, all the same, they are of imperishable wear and a shining ornament to those who possess them. Truth, honesty, diligence, are qualities which should always be kept in the foreground of life's perspective; not imitations or dilutions of them, but the realities. It is not sufficient to be up to the half-standard of the American farmer who on being asked how his son was getting on replied. "Oh, John's a very good boy; he may lie a bit and he may thief a bit; but when you've said that you've said all; John's a very good boy."

Thoroughness is the accentuating power in all the better human characteristics. Energy, courage, determination, industry, are strengthened by it, and such steadying aids as orderliness, method and sincerity lend it their support. Thoroughness can be exercised in little as well as in great things; in the working out of the higher ambitions of life and in giving fulness and meaning to the humbler tasks of existence. Thoroughness is as sunshine to a man's efforts, whatever they are. It throws its shafts of light across

many a dark and doubtful way; reveals to a man the true nature of his surroundings and what is his proper relation to them; shows him what is good and what is bad in the materials he may be working with. No mocking will-o'-the-wisps play their fantastic tricks athwart the path of thoroughness. The artificialities and affectations of life disappear from its outlook, and the reality of things stands disclosed. Common sense and practicality hold possession of the road, and every step taken is a step in advance.

METHODS, MANNERS AND PERSONALITY.

Method is a necessity to business "getting on." It is the outcome of the orderly spirit operating through the ages and applying the lessons of experience to the economising of time and effort in any department of business action. To master the method by which a business is run, and to improve upon it as far as possible, should be one of man's first endeavours. Business manners are also an important matter. A man can be and ought to be polite and considerate, no matter how great his hurry. Even with panting motors waiting to bear one away, with telephone calls sounding incessantly around one, and the endless stir and hubbub of modern activities assailing at every point, the habit of courtesy should never be laid aside. Office manners are one thing, however, and workshop manners another; but the principle and the effect should be the same in both. "There is always time enough for courtesy," said Emerson. It requires personality and character, however, to rise to the best on all business occasions; but with these to his equipment a man can go forward with a good heart, and he will not fail.

Yesterday you have done with, except to remember its lessons. To-day is yours; make the best of it. Think always how you can employ it to the best advantage to yourself and your employers. To-day is your present direct, assured concern; if you make the best of it you score a success, and every successful day is a stepping-stone to higher

successes. There can be no happier feeling at the end of a day than to know that you have put all your duty into it; it will be pleasurable to recall it, and will make of to-morrow a bright to-day, for the light of good achievements extends far into the future. It may be, as the poet has it, that "to-morrow never comes"; still, it is well always to be looking forward to and preparing for it.

PRESENT BUSINESS CONDITIONS.

Some people imagine that in these times business is a terrible affair of hustle-bustle, bounce and boom. These people do not see into the heart of things. I know what I am talking about when I say that business was never more orderly than now, never more honest, never better conducted, never so rich in opportunities for those who have business intelligence and the right capacity and conscience for work. True, our business pace has been wonderfully increased, our business methods have been greatly intensified, our business aids immensely multiplied, and our money-making propensities have in no wise slackened; but with all the flutter and fuss of steam, electricity, telegraphy, aviation, motoring, and the rest, the winning qualities in business are the same now as when the De la Poles, the Whittingtons, the Greshams, the Denisons and other commercial and financial magnates of former times rose to greatness. Conditions change, but not human nature. The present of any period always seems a mighty whirl of advance upon the past; and the sooner one gets into the full current of things as they are, and accustoms oneself to it, the better are one's chances. Loitering on the brink is the road to nowhere. You must tackle the water if you want to learn to swim.

It is reported that the French Government is working out a plan for the purchasing of and payment for textile machinery and supplies, to be accumulated in anticipation of the close of the war. Belgium is also preparing her plans for rebuilding and equipping her industries after the war.

CENTRAL EUROPE.*

BY FRANK NOYCE, I.C.S.

CIRCUMSTANCES have prevented us from reviewing this book earlier. The delay is, however, of no great importance for the ideal it puts before the German people has unfortunately still to be finally shattered though, perhaps, it appears to them somewhat less likely of fruition than it did when Naumann's book was published in Germany in the early days of the war. In any case, the book deserves notice in a journal devoted to Economics for, as Professor Ashley explains in an interesting introduction, Naumann is the most widely read political writer in Germany and his book is far and away the most important book that has appeared in Germany since the war began. In these circumstances, a very brief account of the career of its author is not out of place. Naumann began life as a Lutheran pastor and his first enterprise was an attempt to convert an Association for evangelistic work among the masses into an instrument for practical social reform. The attempt failed and Naumann thereupon gave up clerical work in order to create a National-Social party in the country and the Reichstag which was to combine all the practical objects of Social Democracy with middle-class enthusiasm for naval and colonial expansion. He made little or no headway on the working class side and his activities thereupon took a new direction. He turned towards the middle-classes and came in touch with the bourgeois Radicalism of South Germany. His programme was to secure influence in this party by vigorous advocacy of free trade and to use the influence thus gained to convert it to social

**Central Europe* by Friedrich Naumann, Member of the Reichstag. Translated by Christabel M. Meredith. London. P.S. King and Son, Limited. 7s. 6d. net.

legislation. He was successful in getting into the Reichstag and did something to bring about the amalgamation of various small radical groups. That was some nine years ago but the economic philosophy of that period has now been thrown overboard and in the present book he appears as a strong advocate of the protection of which he was formerly one of the most strenuous opponents.

What is the vision which Naumann presents to his German readers in his book which is a monument of German thoroughness and, it is not unfair to add, of German "stodginess." The war, according to Naumann, will certainly not be "a war that will end war." Trenches will, however, take the places of fortifications when it is over. Where are these trenches to be drawn? There will, he holds, be two long ditches from north to south across Europe, one from the Lower Rhine to the Alps, the other from Courland to either the right or left of Roumania. The problem he sets before his readers is to decide whether or not another intermediate ditch dividing Germany and Austria-Hungary will be needed in between the two great north and south ditches. The object he sets before himself, though he is careful not to state it so crudely, is to persuade Austria-Hungary that it would be entirely against her interests that such a intermediate ditch should be dug and that her only hope of salvation lies in casting in her lot unreservedly with the German Empire. There are, of course, far wider implications than this. Naumann, in company with all right thinking *Germans* holds that the day of the small state is over. "Neither now nor in the future can small or even moderate sized powers play any part in the world". "The spirit of large scale industry and of supernational organization has seized politics." It is patent that he looks forward to a federation for purposes of offence and defence, military and economic, consisting primarily of the

German Empire and the Dual Monarchy but also including not only the Balkan States and Turkey but also Roumania, Greece, Denmark, Scandinavia, Holland and what he is pleased to call a "regenerated" Italy. But the first essential is the permanent association of Austria-Hungary and Germany. That once brought about, the errant bodies on their borders will easily be drawn into the orbit of the new sun thus created. Naumann realizes—no one better—that there are great difficulties in the way of the permanent association of Germany and Austria-Hungary. In such an association, Germany would be bound to be the predominant partner and he is fully aware that this would not be altogether pleasant to Austrian, and even more to Hungarian, susceptibilities. He therefore uses every artifice of rhetoric to gild the pill as far as possible. His Mid European State Union when it comes into existence will have nothing to do with religious matters, nor will it touch school affairs. The language question will be left to the decision of the individual states, though German will naturally be the language of the Joint Commissions, which are all the fresh governmental machinery which in the first instance he proposes to set up. These Joint Commissions will prepare the machinery for, and carry out the instructions of, the several governments. The whole sphere of internal administration, the constitutions of commune and state in the narrower sense of the word, will also remain undisturbed by the Central European State Union. It certainly looks as if, under this arrangement, Austria-Hungary would retain a full measure of independence but closer examination shews that this would not be the case. The new Economic State will deal, through the Joint Commissions, directly with customs, the regulation of syndicates, export organizations, patent law, trade marks, the control of material and similar matters and indirectly with traffic policy, social policy and "many

other things." Prague will be the Mid European centre for all business connected with treaties that is not obliged to be done locally, Hamburg the centre for overseas trade, Berlin the central money market and Vienna the legal centre. It is important to notice that the sphere of joint action embraces much more than would appear from this enumeration. Naumann holds that the outcome of the war will, as far as Central Europe is concerned, be a State System of storage and that the financial policy of the two Empires will rest mainly on State syndicates combined with guarantees for work people. The State syndicate will involve the imposition of a tax obligation upon an industrial association which will receive as a compensation the right to be the only one of its kind. The State will require the management of the Syndicate to produce the requisite millions in whatever way it thinks wise commercially. If, therefore, the Joint Commissions are to deal with the regulation of syndicates, their activities will extend over the whole economic life of the people. It is, therefore, only natural that Naumann should consider that out of this state of affairs will eventually emerge a Mid European Army statute which will distinguish between the general military obligations of the Allied States which must be the same for all who share in the "trench protected partnership" and the special rights and sovereignty of the single States and that this will also apply to the navy. He is very cautious regarding foreign affairs and commits himself no further than to say that closer approach and joint representation are possible, that, as regards embassies, all general letters and communications might be interchanged without further ceremony and, as regards consulates, a single representative for small stations should be preferred on principle.

But it is the economic aspect of Mid Europe that is of the greatest interest to us here. Naumann's book should have the effect

of removing a misapprehension in regard to the Mid Europe ideal which is widely prevalent in England, where it is commonly regarded as involving complete free trade between its partners. Naumann realizes, as Professor Ashley points out, that any large measure of internal free trade is for the present and for a long time to come quite outside practical politics. What he advocates is a system of intermediate duties falling under three classes. The first class comprises cases in which one of the two economic areas needs no duty at all on certain goods because it stands of itself above all competitors as, for example, many sections of the German chemical industry. In this case, the other area (which would, in the great majority of cases be Austria-Hungary) might be in the position of having a small but yet not worthless industry to protect. If regulation by syndicate is inapplicable, the second area must, in Naumann's opinion, be entitled to add an additional duty to the joint tariff on its outer frontiers and to levy this additional sum as an intermediate duty on the boundary between Germany and Austria. The second class of cases is those in which industries of the same kind exist in both areas which demand a like protection against the foreigner but which are of such different strengths compared with each other that the one desires protection against the other in home trade. The examples Naumann gives are, on the German side, sections of the glass industry and, on the Austrian side, the clothing manufacture. In these cases he proposes the levy of a duty on the inner boundary in favour of the weaker party, the duty to be less than the tariff for foreigners but high enough to do away with the superiority. The third class of cases consists of those in which there exists, in both areas, products which are in a weak position in international trade but which are saved from extinction by the support of the home population. These cases will have to be examined on their merits to see whether in them also risks do not arise from the Union which may be warded off by preservative duties.

Such in outline is Naumann's scheme. Hungary is, of course, the greatest obstacle to its realization but he obviously counts on the pressure of the political situation to compel the acceptance of his proposals. Only by entering into such union can the Magyars count upon retaining their predominance over the Slav races within their borders. If this is not sufficient, Naumann is not, however, above offering a veiled threat. He points out that for Austria-Hungary the trade with the German Empire far exceeds all its remaining foreign trade, being 39.5 per cent of imports and 40.8 per cent of exports, but that this trade is of much less importance in the foreign trade of the German Empire, the imports being only 7.7 per cent and export 10.9 per cent of its total trade. "For Austria-Hungary, the German trade is absolutely the primary factor in commercial policy, an unconditional vital necessity." In other words, if Austria-Hungary will not enter an economic union voluntarily, there are ways and means of making her!

The book is singularly free from animus against England. Naumann refers to England's "careful and malicious plan of blockade" but that is almost the total extent of his disparagement. He holds that a permanent understanding with Russia after the war would be impossible so long as Germany and Russia are opponents in Turkey, the Balkans and in the Slav districts of Austria-Hungary and that such an understanding would mean bartering an independent political future for a temporarily great economic advantage. It would be easier, he thinks, to contemplate a permanent union with England, a surprising admission when compared with the virulent outpourings of most German publicists since the war broke out. Naumann is fully aware that the German is not loved abroad, but comforts himself with the reflection that it is because he has found a method of work in which now and for a long time to come, no other nation can imitate him and which consequently the others do not regard as fair. Organization it is that has caused Germany to be hated even whilst she is envied and feared. But the war has shewn that the British Empire can, under the pressure of necessity, also organize and its power in that direction will yet prove the most potent factor in preventing the fulfilment of Naumann's dream.

THE ATTRACTION OF SETTLERS TO THE MALNAD.

BY S. N. APPANNA IYENGAR, B.A., B.L.

THE sparcity of population in the malnad regions of the Mysore State has been a matter of grave concern both to the Government and to the public. This state of affairs is most marked in the purely malnad taluks of Nagar, Sagar and Tirthahalli and perhaps Koppa, Mudigere and Saklespur. Whereas the malnad taluks of the Hassan and the Kadur districts have been "rescued" by the many coffee estates which form a distinct feature of these tracts, the malnad taluks of the Shimoga district have no such redeeming feature. It might, perhaps, be said that areca takes the place of coffee in this district, and that therefore there could not be much of a difference. This contention apart, it is a grave problem as to how to repopulate the malnad, and bring it to its pristine state of populousness and opulence. For do we not read in history that Nagar was the chief seat of a flourishing kingdom till the rise of Hyder Ali marked the end of the Bednur Chiefs? Then, again, Kavale-durga, Ikkeri, Keladi, Humacha and many other names come prominently to the mind's eye when a study of the history of the malnad is undertaken. It is, therefore, a question if through organized efforts and persistent and strenuous propagandist work it is not even now possible to repopulate the malnad. Some attempt in this direction has been made in the Shimoga district, and it may not be out of place to mention here what has hitherto been done in this matter. New settlements have been started in as many as two dozen centres, their population consisting of immigrants from the adjacent Canara districts, and from even far-off Travancore. These settlements have been possible because of the impetus given by Government in the

shape of concessions to people undertaking to make the Mysore malnad their home. The following is the nature of these concessions:—

- (i) Each family is given Government assessed waste land up to a maximum limit of eight acres and the same is registered in the name of the settler.
- (ii) These lands are held free of assessment for the first three years and on half assessment for the fourth and the fifth year, after which period full assessment will be levied.
- (iii) House building material is granted to each settler free of cost.
- (iv) Each family is given an advance up to a limit of Rs. 100 for

the purchase of seed-grain and bullocks and also for incidental expenses inevitable when a family arrives in a new place.

N. B.—These loans are granted on the settlers furnishing some reliable surety or in exceptional cases on the joint security of the settlers.

- (v) Each new settlement is laid out at Government expense, and a draw well is also provided from the same source for the convenience of the settlers.

- (vi) The services of a medical man are usually made available to the settlers on the spot by a Sub-Assistant Surgeon or an Assistant Surgeon visiting the settlement once a week.

A classified list indicating the names of the settlements, the number of families settled, the number of acres granted and the amount of money advanced is given below:—

No.	Taluk	Village	No. of families Settled	Extent of land given out for cultivation		No. of families	Loan granted	Expense incurred by Government
				Acres	Guntas			
1	Shimoga	Timkapur	11	34	39	...	...	328
		Anpinkatte (Laxmipur)	9	60	2	9	900	910
		Kattehole (Varadarajapur)	11	57	32	9	720	174
2	Sagar	Mumbal	16	82	37	15	705	1,016
		Talaguppa	16	55	7	16	1,200	663
		Achapur	3	5	25	...	...	564
		Sydur	3	15	12	1	50	...
		Hiremane	3	19	12	1	100	...
		Hanagere	1	1	38	...	...	...
		Jambagar	2	10	30	...	...	...
		Kallahalli	3	4	27	2	100	...
		Balagere	3	8	10	...	...	...
		Nadavaddahalli	7	38	24	3	150	223
		Dombe	3	19	4	...	...	...
		Khandaka	1	6	35	...	...	...
		Hosur	6	32	27	6	390	...
3	Nagar	Kerehitlu (Padumana-bhapur)	14	103	7	...	...	274
		Mudagoppa	4	4	16	4	200	...
		Masakalli	4	15	31	4	200	...
		Kodasi	1	4	17	...	...	...
		Mugadati	2	9	30	...	...	...
		Halandur	2	11	33	...	...	...
		Baisi	3	7	19	...	...	...
4	Shikarpur	Chickbilagungi	1	7	6	...	...	...
Total			621	618	...	70	4,715	4,152

From the above statement it will be seen that on the whole 129 families have settled till now, that 618 acres of land have thus been granted to these settlers and a total sum of Rs. 4,715 has been advanced to the people for their initial requirements.

It is worthy of note, that the inhabitants of two settlements, Varadarajapur and Laxmipur, both in the kasaba hobli of the Shimoga taluk, are Mysore maidan ryots, and that there seems to be ample scope for a re-adjustment of population in the State itself and the conversion of at least a portion of the maidan landless class into malnad landed proprietors.

The experiment of assimilating the West Coast ryot into the malnad has, however, been found by experience to be easier, because the annual excursion of the below-ghat cooly to the Mysore malnad in search of agricultural and other labour, has been a phenomenon of at least some decades; and he only needs some temptation of the sort now offered by Government to make him a resident of the State. By years of visiting and re-visiting, the Canara cooly has become inured to the malnad climate, and there seems also to be a family resemblance between the South and North Canara people and the inhabitants of the purely malnad parts of the State. Moreover, there does not appear to be any considerable difference in the climatic conditions of the Canara districts and the Mysore malnad, except that the malnad man has not the sea-breeze in such abundance or so unhampered as the more fortunate native of the West Coast districts. Barring this solitary fact, the method of life, the tastes and feelings of the malnad ryots and those of the West Coast man seem in a large measure to agree. This is a circumstance very favourable to any attempt at colonizing the Canara coolies permanently in our State. Thousands of these people annually climb up the ghats and they spend the major portion of the year either working

in areca plantations or making roads, building houses and doing work of practically all sorts. There are instances where such coolies spend even eleven months in Mysore, and go back to their places only for a month returning thereafter to resume their work for another similar period in the malnad. The opportunity, therefore, seems to be most favourable for a well-organized attempt to be made to induce these people to take up their abode permanently here.

The urgency for such a measure is even more pronounced at the present juncture, owing to the fact that in British India, especially along the West Coast, there is a prospect of increased industrial activities. What with the existing fish oil industry and its development with a soap-making branch of work, and what with the announcement that Messrs. Tata's contemplate the establishment of margarine factory somewhere in the West Coast, the situation with regard to labour will be still more acute. The usual influx of West Coast labour into the Mysore malnad will not, therefore, continue in the same uniform manner, and the day may not be far distant when the Mysore malnad areca planters will have also to feel the pinch. There has already been a falling off in the number of labourers climbing up the ghats, owing to the fish industry and to the systematic exploitation of desirable and satisfactory labour by the well-organized Labour Department of the United Planters' Association of Southern India. The moment is therefore not a bit early for the Mysoreans of malnad to wake up and realise the gravity of the situation. Every landed proprietor, be he an areca planter or a paddy grower, who will induce the South Canara cooly to permanently settle down in Mysore does an incalculable amount of good to the country. He will help to keep the labour that has of its own accord arrived at his doors. His agriculture and other work will thereby be facilitated and he will himself have around him a set of contented agricultural labourers

who will be useful to him in more respects than one.

There are ascertained to be thousands of acres of assessed waste lands lying fallow in the taluks of Sagar, Nagar and Tirthahalli; and even the other semi-malnad taluks of

Shikarpur, Sorab, Kumsi and Shimoga have innumerable acres of such land awaiting the advent of the cultivator. A tabulated statement showing the extent of such land, and its nature with regard to each taluk is given below :—

Statement showing Talukwar assessed occupied area available for cultivation in the Shimoga District.

No.	Taluk	Assessed unoccupied area available to be taken up in villages under the operations of the M. I. Scheme					
		Garden		Dry		Wet	
		Acres	Guntas	Acres	Guntas	Acres	Guntas
1	Sagar	406	33	15,117	29	9,891	39
2	Shikarpur	4,455	8	14,254	19	179	39
3	Nagar	211	10	6,510	18	8,085	24
4	Sorab	11	29	9,913	31	1,869	4
5	Shimoga	69	14	5,757	34	2,280	36
6	Tirthahalli	198	7	3,663	20	2,803	6
7	Kumsi	2,062	33	1,243	37	397	13
8	Honnali	14	12	3,194	8	238	21
9	Channagiri	27	18	1,884	24	346	34
	Total	5,457	4	61,540	20	26,093	16

Printed lists of such assessed waste lands furnishing the needful particulars for each village have been prepared by the Malnad Improvement Committee and they can be had on application to the Secretary.

Repeated and persistent explanation to the people, with a missionary zeal of the advantages available to intending settlers will not fail to be productive of some tangible results at least. Moreover, the aspect of social service underlying the whole work and the vast field it affords for a labour of love by any voluntary organization are other factors which should not be lost sight of.

Is it therefore too much to hope that every patriotic malnad landholder will try to settle at least a dozen families during the current year and help in the great cause of improving this beautiful but alas! backward portion of our beloved State? The merest beginnings have just been made in the Shimoga district. The work is pregnant with possibilities. And it only remains for both the Government and the people to put their hearts into this splendid and stupendous work, consolidate the little that has already been commenced and to develop it on bold and generous lines.

ASBESTOS INDUSTRY IN MYSORE.

BY "MERCANTALIST."

ONE of the most interesting features in connection with the recent development of mineral industries in Mysore is the unprecedented activity that has lately been in evidence in respect of the exploitation of the asbestos deposits in the State. Although asbestos is neither a necessity of life, nor an article of universal consumption or use, its uses are many and varied. Its fibrous texture, its flexibility, its practical insolubility in ordinary acids, its combustibility, and its poor conduction of both heat and electricity, especially in fiberized, porous masses, render the mineral an important raw material in a number of manufacturing industries.

The asbestos of commerce includes several fibrous minerals, all of which are characterised by the common and essential property of fibrous structure and may be classed as either (a) Amphibole or Hornblende Asbestos or (b) Chrysotile or Serpentine Asbestos. The latter is the better of the two varieties in quality. It occurs in reticulating veins from one-fourth to three inches in width, in serpentine rocks, the fibres being arranged at right angles to the walls of the veins. These fibres which are easily separable, are very fine, of a silky appearance, and flexible to a high degree. In amphibole asbestos the fibre is usually brittle and therefore of little value as compared with the chrysotile asbestos, which, although finely fibrous and pliable, has sufficient tensile strength to permit of being spun into threads for textile purposes.

The difference between good and bad asbestos can be at once ascertained by subjecting the fibres or long, slender crystals to tearing, twisting, and bending between the fingers. The good asbestos, applicable to

the finer purposes of manufacture, will give up silky threads of great elasticity, and amenable to the various spinning processes; while bad asbestos will split up into harsh and sometimes brittle fibres, occasionally breaking up when rubbed between the fingers.

The heat resisting properties of both the varieties is approximately the same; so that when this characteristic of the asbestos is the only quality desired, the amphibole variety is found to be equally as satisfactory as the chrysotile. But whenever strength of fibre as well as non-conductivity of heat is desired, the chrysotile variety is the only one that can be used with advantage.

The commercial application of asbestos is said to vary greatly in different countries. The European market calls for long fibre to be used for spinning, braiding and weaving, while in the United States large quantities of short fibre are used in the manufacture of pipe coverings of all descriptions.

The most widespread use of asbestos is as a binder in various forms of cement for covering steam pipes, etc., and for the manufacture of paper goods, for building purposes and asbestos shingles so extensively used in some European countries. The covering composed especially of asbestos fibre is extremely good for underground work and for railroad service, as it is not injured by either heat or dampness and withstands the vibration.

Asbestos fibre may be spun into yarn and rope, and woven into fabric, in which form it finds many uses where a fire-resisting fabric is required. For these purposes a long fibre, both strong and very flexible, is desired.

In the making of mineral flooring short fibre asbestos enters into the mixture, where it acts as a binder.

Asbestos in fabrics is used for automobile tyres and as friction facing for automobile brakes. For both high and low pressure

steam packing asbestos is said to be replacing rubber. The application of electricity as the power of commerce during recent years is also increasing the use of asbestos in manufacturing insulating tapes, boards and similar goods for many special electrical purposes.

The amphibole type of asbestos is used chiefly in the manufacture of retort and furnace cement.

Short fibre is mixed with paints to produce a fire-resisting paint. It is also used in making stove cement, pipe covering, etc.

Long fibre, besides the uses referred to above, is used in making gaskets for packing glands and pipe joints where high temperature or acid solutions are encountered, in the making of chemical and water filters, and as a surfacing of gas grates.

Asbestic is a name applied to impure very short fibre asbestos. It is used by plasters, manufacturers of roofing and also for a number of purposes referred to above.

The manufacture of articles of merchandise composed wholly or in part of asbestos fibre is steadily increasing in Europe and America and since it is recognised as an important factor of safety, there can be no doubt that new uses will continue to be made and that there will be a constantly growing demand for the mineral.

Turning now to the activities in Mysore, we find that asbestos has been found and prospected in many localities in the State but, in quality, so far as is known at present, it is generally of the amphibole type and in quantity irregularly distributed. The better grade of material, chrysotile, which is associated with serpentine, has been noted near Hole-Narsipur and Idegondanhalli in the Hassan District, but investigations have yet to be made in order to obtain definite estimates of the quantities available for exploitation.

The less valuable amphibole variety is known to exist in several places some of which are :—

Bangalore District.—White asbestos at Avalhalli about two miles from Bangalore on the Mysore road.

Tumkur District.—Birasandra three miles from Banasandra Railway station.

Mysore District.—Near Nagamangala two miles south-west of Mandya. Near Konour about twelve miles south-east of Nanjangud.

Hassan District.—Kabbur, Hole-Narsipur Taluk, near the 30th mile on the Yedatore Hole-Narsipur Road.

Near Hole-Narsipur, Sunnakal, Hosur and Idegondanhalli.

Kadur District.—Near Mudsosi, Mudgere Taluk.

Near 4/16th milestone on the Belur Mudgere Road.

Chitaldrug District.—North-east of Mayakonda village.

Near Budihal, Gangigere in the Hosdurga Taluk.

The asbestos occurs in bunches and aggregates of fibrous material. In the Kabbur Mine in the Hole-Narsipur taluk long fibre asbestos, several feet in length, can be picked out practically clean. The long fibre can be easily separated as completely as possible by hand from the waste rock and from that carrying the short fibre. The material can be reduced to a white fluffy mass which should possess some merits as an insulator, steam pipe covering and where strength of fibre is not essential.

The asbestos is graded according to the length of the fibre. The market price of asbestos varies greatly according to the grades of the length of fibre and demand. The long fibre always commands a much higher price than the short. The present prices of asbestos and asbestos products are encouraging. Information from the Commonwealth Offices in London is to the effect that every particle of asbestos is now worth £20 per ton.

There has also been a specially growing demand for asbestos since the outbreak of the war owing to the fact that it has a new application as a material of war, being employed largely in the construction of new naval vessels and as a protection against incendiary bombs. The following statistics

relating to the imports of raw asbestos into the United Kingdom may be of interest, as indicating the market in that country, the sources from which it gets its supplies and the enormous increase in the demand for the mineral.

	1913		1914		1915	
	Short tons	Value	Short tons	Value	Short tons	Value
		£.		£.		£.
Russia	1,770	45,617 18 4	1,403	29,181 13 4	230	4,045 8 4
Germany	392	8,507 10 0	296	9,200 0 0	...	.....
Portuguese East Africa.	216	3,911 0 10	329	5,926 5 0	796	15,397 18 4
Italy	101	2,636 0 10	84	4,402 5 10	39	1,602 18 4
United States ...	1,239	5,749 15 10	1,800	16,813 6 8	3,701	36,395 12 6
Other foreign countries	174	2,498 6 8	172	2,722 5 10	453	1,559 7 6
	3,892	68,920 12 6	4,084	68,245 16 8	5,219	59,001 5 0
Cape of Good Hope ...	635	8,572 10 0	932	19,139 3 4	3,039	78,212 10 0
Natal	5	94 7 6	80	1,910 4 2	358	8,453 15 0
Canada	8,443	74,988 2 6	11,326	93,426 17 6	19,592	212,563 15 0
Other British Possessions	20	275 16 8	58	801 17 6	378	6,588 6 8
Total British Possessions	9,103	83,930 16 8	12,396	115,278 2 6	23,367	305,818 6 8
GRAND TOTAL ...	12,995	152,851 9 2	16,489	183,523 19 2	28,586	364,819 11 8

From 1907 to 1912 inclusive, the imports ranged between 6,477 and 8,620 tons. In 1913 there was a sudden increase to 12,995 tons and in 1915 a further increase to 28,586 tons.

Most of the civilized countries in the world, keeping pace with the development of new applications, use asbestos in large quantities and every year has been witnessing a considerable increase in the consumption of this mineral.

In Mysore it is gratifying to note that there are at present very good indications

that some of the leading representatives of manufacturing and producing industries have been taking a specially keen interest in the organization and development of the asbestos industry in the State—an interest which doubtless has been greatly stimulated not only by their industrial enterprise, but also by the encouraging demands for asbestos and the high price which it commands. As a result of this interest, serious operations have been in progress in the Kabbur mine in the Hole-Narsipur Taluk during the past one year and a quantity of 150

tons of asbestos has been extracted. Out of this 93 tons have been used locally for industrial purposes. The first use made of the asbestos from this mine was as an insulating material for covering boilers, steam pipes, etc., at the Sandal Oil factories in Bangalore and Mysore and it is reported that the material proved itself quite suitable for the purpose for which it was applied. Owing to the modern use of high steam pressure in manufacturing processes, the employment of asbestos packing has become a necessity; because packing made from organic substances burns out and quickly becomes unreliable. Asbestos packing is, therefore, employed in almost all high pressure plants, as well as very generally on the war ships of the navies of the world. As a consequence of this, its use is constantly increasing.

Further tests of the samples of the asbestos boiler covering composition from the material of the same mine made at the Indian Munition Factories, Dum-Dum and Kirke, are also reported to have yielded satisfactory results in comparison with the usual composition for covering boilers, steam pipes, etc. These encouraging results, as well as the special demand created for asbestos by the war, have offered inducements to the licensees of the Kabbur mine to take out a mining lease for a term of thirty years and certain other gentlemen also to apply for prospecting licenses over certain known areas in the neighbourhood of Hole-Narsipur. If the developments that are now being carried on or are to be hereafter carried on in these areas, disclose any broad zones of high grade fibre rock, the outlook for the field will be bright.

There are yet vast areas in other parts of the State which need exploration and development and several others which still remain unseen or untouched. Exhaustive information has yet to be collected as to the quality, quantity and distribution of the raw materials suitable not only for export

but also for local consumption and manufacture.

The question of carrying on prospecting work on a large scale in these areas deserves special attention and if the operations meet with success, there can be no doubt that the State will witness the birth of a new industry. What is particularly needed at present is (1) a systematic exploitation of the areas already known to contain workable deposits of asbestos; (2) an exploration of the hitherto untouched areas in the State with a view to locate new and productive grounds and ascertain the possible sources and quantities of supply; (3) a number of experimental tests to ascertain the suitability of the asbestos obtained for use in manufacturing industries, and for engineering and other local purposes; and (4) an investigation of the commercial possibilities of local manufacture of asbestos products.

Up to the present the work done has not gone beyond the prospecting stage and the material obtained so far has mostly been from close to surface. The sinking of a number of deeper pits in each of the areas is therefore a matter of vital necessity not only to ascertain whether the fibre becomes stronger while retaining sufficient facility for easy separation, but also for the work to be remunerative, and particularly where the ore body is large and continuous.

There may naturally be some apprehension that the asbestos veins should prove to be merely superficial phenomena and cut out in depth. Against this, may be set the fact that the formation of asbestos is believed to be a deep-seated process, *i.e.*, that asbestos may be found at considerable depth. This is evident by the fact that in many of the workings in Canada asbestos has been met with at a depth of 200 ft. and that it is also reported to have been encountered lately at so great a depth as 400 ft. in one of the chrome-iron-ore mines.

The mechanical separation of asbestos is yet unknown and untried in Mysore and if this can be introduced several localities hitherto neglected may also be developed and put on a productive basis.

DIFFICULTIES IN THE WAY OF INDUSTRIAL DEVELOPMENT.

BY S. G. SASTRY, B.A., M.Sc.

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IT is intended in this article to point out certain practical difficulties which we shall have to contend with in our industrial advancement. It is the outcome of a close study of certain general conditions prevailing in England and which directly and indirectly contribute towards her economic efficiency. What is true of England is also true of the United States of America and Germany to a greater extent. Any scheme of industrial development in Mysore must take into consideration all the points mentioned in this article.

One great advantage which the foremost industrial and manufacturing countries possess is the existence side by side of what may be termed as "sister industries." By this means a manufacturer may obtain all his machinery in his own country, the bye-products of one industry can be productively utilized in another industry and so on. The different units of the entire complex industrial system are interdependent and the *net* results of such a system are eminently satisfactory and economically sound. In our ability to choose the right industries for Mysore lies the solution of one of our chief difficulties. This choice should naturally depend on two main considerations: (1) It must be based on the principle of utilizing the Agricultural and Forest products of the State—importing only those things that cannot be obtained locally, such as machinery and certain chemicals; and (2) It must take into account the possible utilization of the bye-products.

There is prevalent in India, generally, a tendency to ignore the local conditions before an industry is started. Because such and such a thing is manufactured in a foreign

country and is imported into India, the idea is that it is quite a simple matter to manufacture the same article in India. Lack of foresight, the want of practical skill and technical knowledge, and the absence of expert advice—all these contributed to the failure of many industries in India. In many instances the exuberance of enthusiastic admiration of achievements of applied science was not followed by any practical step to start new industries with expert scientific guidance and on a sound economic basis.

A great many industries that are flourishing in India to-day are financed by foreign capitalists, and the wealth created thereby is foreign wealth which directly benefits *not* Indians but foreign capitalists. The Kolar Gold Fields, the Manganese Mines, and several of the coffee plantations in the State may be quoted as instances of foreign enterprise. It was in the year 1912 that Mr. A. Chatterton made the following remark and every Mysorean ought to take it to heart: "Mysore will benefit little by State industries worked by foreign capital and controlled by foreign brains. It will benefit much if a broad industrial foundation is built by securing an economic utilization of its agricultural products. If you wish to achieve any thing in future the foundations must be solidly laid in the present. Attention must be concentrated on the improvement of primary industries before any useful work can be done in connection with the development of a complex industrial system such as has grown up in Europe and America within the last century."

In the early stages of our development we ought to pay a great deal of attention to the establishment of what Mr. A. Chatterton has called "primary industries," which are usually termed "key" or "pivotal" industries. In connection with these key industries too much stress cannot be laid on the importance of scale, because many industries which pay well on a fairly large

scale will be doomed to failure on a smaller scale. It is yet very doubtful whether we, the people of Mysore, are financially strong to start new industries on a large scale. A thorough investigation should be made before hand as to the chance of success of an industry which is going to be started on a small scale. An example of what a large scale production can accomplish is to be found in the Cauvery Electric Scheme for which the credit is due to a single statesman and not to private enterprise in Mysore. There are, however, a number of industries which promise to pay even on a scale which Mysore can afford at present. We shall take some of these into consideration in this article. When the time comes, the pivotal industries must be started on as large a scale as possible, consistent with other economic conditions in Mysore. We shall now take a survey of the difficulties we hinted at earlier in this article.

I shall begin with the question of fuel. Lack of cheap fuel in Mysore is a distinct bar against success in those industries in which fuel plays an important part. All those industries in which radiant energy is required for heating purposes come in this category. A great number of industrial processes depend on the application of heat directly or indirectly in the form of steam. To quote a few examples—Sugar-refining, Soap-making, Wood-distillation, Candle-manufacture, Iron-foundries, other metal foundries, Pottery making, Brick and tile-making, etc.—all these require the application of heat either directly or indirectly at one point of the process or other. Coal is too costly for our use in Mysore. The price of coal in Mysore is about three or four times as much as it is at the pit's mouth. The production of coal in India in 1890 was 2,168,521 tons, in 1912 it had increased to 14,706,336 tons; it must have increased still more during the last four years. But by virtue of its being far away from Indian coal-fields and on account of

heavy freights on Indian Railways, Mysore is compelled to pay a heavy price on coal. Moreover most of the coal produced in India is bought by the Railway companies for their own use. For these reasons, Mysore is compelled to make use of other substitutes for coal. Where power is required to drive machinery, Mysore is very favourably placed since electric power can be utilized. In this connection it is worth while to note that the cost of production of electric power in Norway is much cheaper than in Mysore. According to the figures quoted by Professor Fleming, whereas seventeen units of electricity can be obtained for a penny in Norway, only four or five units can be obtained in Mysore for the same amount. In both countries waterfalls are harnessed for generating electricity, and the above figures tend to point out clearly that we are not working as efficiently as we may. This is, however, a point for the Government to consider and set right so that the people of Mysore may be benefitted. Reverting to our point, wherever motive power is required to drive machinery, electric power still remains the cheapest source in the cities of Mysore and Bangalore. Outside these two cities we shall have to fall back on oil or gas-engines, or wherever possible on steam-engines. In the case of gas and steam-engines, the only available source of fuel the State will have to utilize, namely, timber from State forests and other fuel plantations, such as the casuarina plantations in the districts of Bangalore and Kolar. If we should make an extensive use of oil engines we shall be depending on foreign supplies for the fuel required for these engines.

Since almost all the boilers on the market are designed and constructed with the object of burning coal to raise steam, it is doubtful whether the same boilers will prove equally efficient if timber is substituted for coal. Boilers will have, therefore, to be specially designed to suit the particular form of fuel employed.

Since by using timber as such we shall be losing a number of valuable products that can be obtained from it, the best plan would be to convert timber into charcoal and then use charcoal instead of timber, as a source of fuel. If we want to recover all the valuable products of timber, the only way left open to us is to start wood-distillation. By this means we can recover all the products of wood-distillation, such as methyl alcohol, acetone, acetate of lime, etc., and also convert timber into charcoal. In fact wood-distillation is one of the "pivotal" industries of the State, and it is high time that we started a wood-distillation factory in the State. All the products of wood-distillation will find a ready market in India, and some of them may be utilized in the State, such as methyl alcohol in the lac and varnish industry. It is unnecessary to go more deeply into this subject, since a very good account of the whole problem of wood-distillation was laid before the public of Mysore by Mr. A. Chatterton in a lecture delivered at Bangalore High School on December 22nd, 1913. (*Vide* Economic Conference Bulletin No. 13. "The Generation of Power in Mysore.") In the same lecture Mr. Chatterton deals with the respective claims of gas and oil engines and the writer can only add that a close study of that lecture is well worth the trouble. We shall now close the subject of fuel by reiterating the original point in a more extended form—that unless we are going to profitably utilize the timber of our forests as an economic source of fuel, the industries in which cheap fuel is an essential factor, are bound to be seriously handicapped, if they are to depend on foreign supplies of coal. Wood-distillation will be one of the "primary" or "key" industries of the Mysore State.

I shall now take up the question of (1) Men, (2) Money, (3) Material, and (4) Machinery.

(1) With regard to men.—In spite of the oft-raised cry of scarcity of labour in Mysore,

the writer is fully convinced that a sufficient number of men are available to man all the new industries that the State may be able to start within the next fifty years. The real cause of anxiety is to be found in the inefficiency of labour in Mysore. In all industrial concerns it is the quality of labour and its efficiency that are of primary importance. As compared with an average working-class man in England, the average Mysorean of the same class works for a smaller number of hours a day and less efficiently. So the problem is one of efficiency and our chief difficulty is how to make labour in Mysore more efficient, that is, economically more productive. It is easy to say that they ought to be trained, but the crux of the problem is how is that to be done. Every new industry to be started in the State has this problem before it, namely, the absence of trained men that are essential for the success of the concern. Apart from those men that are sent to foreign countries to receive a special training, every new industry in Mysore will have to train its own men in the early stages. Otherwise expert labour will have to be imported. Since admittedly our policy is Mysore for Mysoreans, the best plan is to train our own men.

(2) With regard to money.—As compared with European countries and America, Mysore is poor—very poor. The traditional hoarded wealth of every Indian seems to exist only in the minds of a few theorists and economists; the glamour of the phrase has persistently clung to the minds of students of Economics, but in reality there is at the present day very little hoarded wealth in Mysore. Whatever amount it may represent in figures, it is not an item to be counted upon as a partial source, at least of the capital required to finance our new industries. The next thing to be considered is about the really well-to-do and wealthy classes of people in Mysore. The number of people in the State who possess an income of a lakh of rupees or more can be counted

on one's fingers. Even the number of those who have property of an aggregate value of one lakh or more (the *Lakshadipathis* as they are called) is very few indeed, and since these have in almost all cases vested their surplus money in the staple industry of the State, namely, in agriculture, there does not seem to be a great likelihood of raising any big capital in the State from these people. To take but one example, the Chickballapur Light Railway Company asked for about twelve lakhs of rupees from the people of Mysore. The value of each share was only Rs. 25 payable in easy instalments of Rs. 2 *per mensem*. The Government of Mysore guaranteed an interest of $3\frac{1}{2}$ per cent. Still the people of Mysore were not in a position to buy all the shares, and after a lapse of about five years it was left to a Bombay merchant to buy up the remaining shares, worth nearly five lakhs of rupees. In spite of the fact that the Railway Company asked for only twelve lakhs of rupees, that the people of Mysore were not in a position to contribute the whole sum required even after a lapse of five years, is of some significance and its lessons are not to be forgotten by those who are contemplating to start new industries in Mysore by raising a substantial capital from amongst the people of Mysore. People in Mysore are not enterprising enough and consequently capital is very shy in Mysore. Even in those cases where a few people possess some money, the capital required to float big concerns will not be subscribed, and the industrial atmosphere so necessary for the commercial advancement of the State cannot be easily created. India is full of examples of costly failures and the people do not want to burn their fingers once more. So joint-stock companies with substantial capital seem to be impossible for the present. There are also strange doubts and misgivings in the minds of a large section of wealthy people about new industrial schemes. The encouragement of a spirit of industrialism and a wide spread

commercial education amongst them may help to improve the situation and eradicate that scepticism that is now prevalent in the land. What we need at present is wealth dynamic; in other words, the existing wealth should be made available in a "liquid" form, and what is at present inert should be quickened into life.

In this matter of money, there are one or two ways in which the Government of the State can help the people. The system of *takkavi* loans, available for purposes of agriculture, should be extended and the Government should advance loans, on sufficient security, of course, to promote the cause of industries in the State. An example of this is to be found in the case of Mysore Tannery Ltd., at Bangalore. Since the *takkavi* loans are granted out of the revenue of the State, the amount set apart for the purpose, cannot, for obvious reasons, be a large one. Even though it may be useful in financing small concerns, the State must look elsewhere for more money to start new industries on a sufficiently large scale. One of the best ways open to the Government of the State is to make use of its credit to borrow money from outside. This is no new practice and it is followed widely in all the countries of the world. To quote a few examples—For one thing and another the Canadian Provinces and Municipalities have borrowed a sum of \$185,000,000, (£37,000,000) up-to-date from the United States of America; this is exclusive of \$120,000,000, which the Government of the Dominion of Canada as such have borrowed. A few months ago the United States of America contributed \$8,200,000 (£1,640,000) towards Metropolitan water and Dublin loans. During the month of November 1916, loans have been arranged for various French Municipalities amounting to about £22,000,000. The above examples show how the Government of Mysore can make use of its credit to borrow money from outside, and then advance loans on sufficient

security, to the people of Mysore who desire to start new industries in the State.

It is interesting to note that Mr. A. Chatterton gave expression to the same ideas in 1912, but unfortunately they do not seem to have been studied by those interested in the matter with due care and attention. To achieve this end the Government and the people should act in concert, and when one seriously studies the problem, the doubt still remains whether the people of Mysore are advanced enough to keep pace with the Government which is undoubtedly in a very advanced State. I cannot enter into further details on the subject in this article and I now pass on to the next point.

(3) With regard to material.—The material resources of the Mysore State are manifold in character. Almost all the elementary necessities of life for a peace loving and rural population are to be found in it. Contact with Western civilization has brought about a profound change in every branch of life and the old simplicity of life has been supplanted by a more complex system, and it is no good trying to go back. We are to take things and conditions as they exist to-day and as they may develop in the future. The immediate problem before us is to find out the best means of utilizing the resources of the State.

(a) As to agriculture.—We must take to better methods of cultivation and increase the yield per acre with all the crops. This can only be brought about by two ways. One is to increase the acreage of land suitable for cultivation. The other is the employment of labour-saving machinery and a judicious use of manure, both natural and artificial. The Agricultural Department of the State is doing very commendable work in this connection, but hitherto the work of the Experimental Farms has

only evinced a certain amount of casual interest in the minds of the neighbouring farmers, but little inclination to copy the methods and follow the example set by the State Farms. This is to be attributed to mainly the following reasons :—(i) There is still a certain amount of scepticism lingering in the minds of the ryots with regard to the results obtainable by the adoption of new implements and novel methods. (ii) The ryots as a class are not well-to-do people and are possessed of insufficient capital. This can be remedied to a certain extent by a more generous extension of *takkavi* loans. (iii) In the case of really wealthy farmers an unwillingness to invest more money to improve their own professional business. This can be overcome by a spread of education amongst them, especially by a sound training in the Agricultural schools of the State.

(b) In regard to the mineral resources of the State, it is quite evident Mysore has her own fair share of mineral wealth. Hitherto the exploitation of the mineral wealth of the country has been left to foreign enterprise. There does not seem to be an easy way out of this situation in the near future. We want bold capitalists, scientists and engineers, and miners and metallurgists—all these in sufficient number before we can launch on such enterprises.

(c) The forests of Mysore form an important economic asset in our industrial future. Revenue from the State Forests is derived

mainly from the sale of the following:—Teak and other timber, sandal-wood, firewood and charcoal, bamboos, grass and grazing fees, elephants, certain tanning materials, other minor produce, and the rent on toddy trees.

The resources of the forests are not limited to the only items mentioned above, and without impairing the standard conditions for the perpetuation of forests, there are a great number of things that can be supplied from the forests annually. There are a number of trees whose timber is of a quality suited for use for railway sleepers, and pit-props in mines. These are at present imported mainly from Burmah. There is no reason why the Mysore forests should not supply, partially at least, this demand for railway sleepers and pit-props. There are certain kinds of wood peculiarly suited for wood distillation, even though all kinds of wood in general lend themselves for the operation. Certain other kinds are suited for match wood; few more for pencils; while others will make good wood-pulp for paper manufacture. There are a number of oil seeds which can be utilized for the production of oils that are suitable for soap and candle manufacture. It will take long to enumerate them all in an article like this. Those who are interested will find them in a book on the resources of the Mysore State published by the Economic Conference. The chief reasons why the forest products are not utilized to their fullest extent seem to be the following:—(i) Many of the forest products have acquired their importance only recently. (ii) The Forest Department is not efficiently organized, and like any other industry or business, the affair requires highly trained scientific men and experts on the one hand, and on the other it requires men conversant with business skill and management. The administrative

side of the Forest Department should be dissociated completely from the business side, which should be conducted by business experts. (iii) The greatest of all difficulties is perhaps the transport difficulty. We shall deal with this subject separately.

(4) We now come to the subject of machinery. Innumerable articles have been written on this subject by a great number of people on different occasions and I do not propose to go into it very deeply here. Use of the most up-to-date machinery is essential to success in all industries. In this connection attention must be drawn to a serious situation in Mysore which has arisen out of a lack of an adequate number of mechanical engineers and mechanics. There is a dearth of workshops in the Mysore State. The only ones that are existing in the State are those in Bangalore (Kolar Gold Mines and Cauvery Electric Works are not taken into consideration here)—namely, the Railway Workshops, the Public Works Workshop, and three or four other workshops connected with the motor trade. At present, if any of our machinery goes wrong we are compelled to seek help either from Madras or Bombay. Mechanical Engineers and trained mechanics are an urgent necessity to our State, and it is high time that a number of students who are specialising in Physics and Mathematics in our State Colleges turned their attention to Mechanical Engineering.

It is not hand power that is going to lead us on to success in industries, but engine power. It is a mechanical age and machinery rules the world.

I have briefly touched on our difficulties with regard to men, money, material and machinery. I will now turn my attention to transport difficulties in our State.

There are at present in Mysore only 5'37 miles of road (State roads and District Board roads) per square mile. For the same area in England there are 50 miles of good road. These roads are suitable for

heavy motor traffic. In addition to these there are a great number of navigable canals in England. In the matter of railways also Mysore is far behind not only of many European countries, but also of many portions of India. As industries grow up transport difficulties will be felt more and more keenly. Even as it is, we are hampered by a lack of transport facilities. The necessity for bettering the present roads and opening new ones is very urgent. We are sure to have motor traffic for commercial purposes at no distant future and our roads are not in a condition to withstand the heavy wear of motor traffic. It will be very useful if an engineer can be deputed to England or America to make a special study of the roads. Another chief drawback with regard to transport facilities in Mysore is the lack of a suitable port. This problem and the extension of railways in the State are being tackled by the Government and we need not go further into these matters here.

It is, however, sincerely to be hoped that in the extension of railways in Mysore, they are going to adopt a uniform gauge throughout their projected system. Considerations of initial cost may favour the establishment of light railways with 2' 6' gauge, but it is a very objectionable policy to pursue, in view of the future industrial advance of Mysore. Apart from the consideration of initial cost, there is very little in favour of light railways. The running expenditure in the case of meter gauge railways will not in any way be far greater than in the case of light railways and the adoption of meter gauge throughout the State not only does away with the transshipping difficulty at junction stations, but a more powerful argument in its favour is that it enables a greater quantity of freight and a large number of passengers to be moved more rapidly, and these facts ought to more than outweigh any considerations of initial cost.

The only other point I would like to touch upon in this connection is with regard to

transport difficulties from the forests. If we are to make use of our forest products, we must have an economic means of transport. At present good roads leading in and out of the State forests are far too few. No doubt the contemplated extension of railways in the State will make several parts of the forests more accessible. But it may not be profitable to take the railways right into the heart of the forests; hence arises the necessity for good roads, suitable for all ordinary traffic throughout the year. Wherever it is found possible and profitable we may have a system of tramways in the forests. No doubt these things are in the minds of our administrators, but our survey of difficulties would not be complete without making a mention of them, and that is the main reason why we have just touched upon the subject.

I shall make a brief mention of other serious difficulties in our way—not because they are less important, but the article would assume unwieldy proportions were these things discussed in detail.

Mention should be made in this connection of foreign competition. This is a factor which is not generally taken into consideration when dealing with industrial problems in India. We may find it a matter of comparative easiness to manufacture an article, but to get a steady market for it is very difficult indeed, in the face of competition from Western nations who have immense financial resources to back them up. We should never forget that they will leave no stone unturned to secure the markets for themselves, and it is simply a case of hard fight for us. The European nations have centuries of experience at their back, their method of advertisement is powerful and perfect, and their effective system of obtaining commercial intelligence through their Consular service is completely organized and in thorough working order. We have none of these advantages in our favour. Another difficulty before us is connected

with patented processes of manufacture in industries. Certain classes of machinery are already costly and may be made easily more costly by exporters in foreign countries.

Amongst a host of other difficulties, mention may be made of the lack of uniform weights and measures in different parts of India. This will have a great deal of influence on the development of internal trade of the country. For the successful promotion of business relationships with other parts of India we are greatly handicapped by the want of a common language for India. This difficulty is already being felt keenly and is bound to be felt more and more in the near future. To a certain extent the English language is serving that purpose now and there is a gradual tendency of its becoming more and more indispensable. Another minor difficulty is connected with religious restrictions against sea voyage and this is hindering many of our young men from freely taking to foreign travel. Foreign travel is indispensable in the coming years if any progress in business is to be attained at all.

In the above survey I have set out some of the main difficulties we have to contend with in our industrial progress. I have purposely left out of consideration two very difficult problems—(i) the prospects of building a fleet of merchantmen, built in India and owned by Indians; and (ii) the question of a protective tariff for India.

Vague ideas are in the air with regard to the establishment of new industries in India. It is utterly impossible to do every thing at the same time. In our enthusiasm we are apt to forget the difficulties in our way. And it is well we should know definitely what these are, so that we may be better able to cope with them.

THE FIRST INDIAN ECONOMIC CONFERENCE.

BY P. J. THOMAS, B.A. (HONS.)

THE Economic Conference held recently at Calcutta is certainly a noteworthy event in our Economic annals considering the representative character and personal weight of those who took part in it as also the growing importance of the subjects discussed at its sittings. It was held in Writers' Buildings facing Dalhousie Square in the fashionable part of the premier City of India, and was attended by about twenty well-known Professors of Economics, both Indian and European, from various parts of the country. Prominent among them were Professor C. J. Hamilton, Professor J. C. Coyajee, and Professor J. C. Kyd of Calcutta, Dr. Gilbert Slater and Professor Saunders of Madras, Professor Stanley Jevons and Professor Bhattacharya of Allahbad, Professor E. A. Horne, Professor Burnett-Hurst, Professor Anstey, Professor Dalvi, and others from Behar and Bombay, Professor Thakore of Poona, and Professor Brown of Assam. Professor Hamilton was in the chair. The Conference sat on the 3rd and 4th of January from 10-30 A.M. to 5 P.M., with of course an interval for lunch.

The first session of the Conference was devoted to the discussion of papers on Indian Labour. Professor Stanley Jevons, Professor J. C. Kyd and Professor E. A. Horne read valuable papers on the subject viewing the problem from different standpoints. Professor Jevons's paper was the result of his valuable researches on the subject of Indian Labour, with special reference to the conditions obtaining in the Gangetic Valley. Professor Kyd enlightened the audience with a statistical account of Jute labour in Bengal, while Professor Horne drew conclusions on Indian labour surveying all the prominent industries in India.

All the Professors agreed in thinking that Indian labour is fleeting, insecure and suffers from seasonal fluctuations. The cotton mills complain of a shortage of labour in monsoon months. The labour of Cawnpore Woollen Mills is insecure and often insufficient. Even the prosperous Jute industry of Bengal complains of labour shortage, though there has recently been an influx of labour from the northern districts of Madras to the Hughli banks. Mr. Kyd showed that Jute labour had trebled during the period between 1890 and 1910, and that well nigh 63 per cent of the industrial labour of Bengal was at present absorbed by this single industry. There was still further demand for labour and so migration from outside had become necessary. The increase of labour can be conveniently effected by improving the conditions of employment. Housing arrangements must be provided for the labourers near the factory as in the case of the Jute Mills on the banks of the Hughli. Mr. Horne said that labour could be attracted by offering small plots of land near factories where labourers could establish their families permanently, and this system would, apart from improving the physique and morale of the labourers, also solve the problem of the insecurity and irregularity of labour. Government could also help by improving sanitation around the factories, by establishing recruiting centres, and by granting railway concessions to migrating labour. He also hoped that decentralisation of industries would improve the situation by enabling agricultural labourers to work in the factories in slack seasons, and thereby would benefit both farms and factories. Was there a rise in the standard of living *paripassu* with the prosperity of industrial labour? There were increasing signs of a perceptible rise, but it was not sufficiently pronounced, and in no way commensurate with the prosperity of industrial concerns.

In the afternoon session, the chief topic of discussion related to the "Industrial Advance-

ment of South India," which was ably dealt with by Dr. Gilbert Slater. Professor Saunders and Professor Burnett-Hurst also read papers on the Cotton Industry. Dr. Slater lectured on his subject with his characteristic good humour and clearness. He first took a rapid survey of the historical, ethnical and sociological past of South India, and spoke in glowing terms of the antiquity of Dravidian culture and institutions. The cheap and abundant supply of power was, he said, the main problem of industrial advancement in South India as in every other country. The River Cauvery supplies power in Mysore for working its gold mines. Such possibilities were latent also in the Periyar anicut in Madura, and an artificial waterfall could, into in his opinion, be brought existence by constructing a reservoir on the summit of Palni Hills. He spoke of the prosperity of the cotton mills of Madras and Pondichery, and touched on the peculiar circumstances and possibilities of the cotton mill at Trichur (Cochin State) which was being worked by Nair women, who, he thought, were admirably fitted to supply useful and abundant labour owing to the unique position they enjoyed in the Nair Tarwad. There was a most unwholesome competition going on in some places as in the case of rice-hulling and tile-making; whilst the greatest potential industry of the country, *viz.*, the oil industry, was still undeveloped. He, therefore, urged the necessity of working on copra, groundnuts, gingelly and other oil seeds which are now being shipped to Europe raw. In the course of his informing lecture, he also touched on the marvellous potentialities of the newly discovered harbour of Ernakulam, which he thought would soon vie with Bombay as an Eastern mart; and also on the splendid artistic and economic significance of lace-making and embroidery work carried on in the convent of Belgian Sisters at Mulagumood in Travancore, which, if spread in the families throughout the land, would

prove to be a source of perennial profit to Professor Indian villagers.

Professor Saunders's paper was an Economic study of some villages near Madura ; and in it he showed the injurious results resulting from the minute sub-division of land going on in the villages of South India, and pointed out that the diminishing extension of Economic holdings would surely tell on the physique and morale of the people and make all advancement slow and difficult. Professor Burnett-Hurst read a paper on the Improvement of Cotton Cultivation, in the course of which he pointed out the growing importance of India's cotton crop to this country and to the whole world and suggested some practical means of improving the crop both in quality and quantity. A short discussion followed on the means of supplementing agricultural returns in villages and on the quantity of the exact economic holding required to support a family. The curious examples cited by those who took part in the debate showed how little was the land needed to support an industrious family. More unique examples might be quoted from the cocoanut growing coast strip of Travancore and its fertile taluks like Meenachil. The Malabar Coast with its marvellous diversity of crops and courses could support more life probably than an equal territory in any other part of India. Here was the secret of Malabar's immunity from famine.

The chief topic of the second day's deliberations was the Indian Currency Problem, which was dealt with in its various phases by Professor J. C. Coyajee, Mr. B. F. Madan and Dr. Gilbert Slater. Professor Coyajee's paper on the Appreciation of Silver was the result of close study of the subject and ably set forth the complex tendencies of the Indian Currency system as affected by the recent appreciation of silver. He discussed the effects of this remarkable phenomenon in the light of precedents both from India and abroad (the similar appreciation of 1890 and

the examples of the Philippines, Straits Settlements and Mexico). He clearly set forth the changed nature of India's export and import trade and the present tendencies of Indian prices. He also touched on the redistribution of wealth in the country consequent upon the present changes, on the debtor-creditor problem, and on many other complex side issues of the Indian Currency problem.

This was followed by Mr. Madan's paper, which in the absence of the writer was read by the chairman. He discussed various aspects of the Indian Currency Problem and pointed out the need for not tampering with the exchange value of the rupee, which ought to stand as at present at 16d. This was followed by a short lecture by Dr. Slater on the After-war Price of Silver, in the course of which he showed that owing to the paucity of silver production at present and in view of the probable increased demand for silver in China and Africa after the war, there would be a continuous rise in the price of silver for many years, after the conclusion of peace. He was, therefore, for raising the exchange value of the rupee to 1s. 8d. or 2s.

There was a discussion on the various points raised, chiefly on the exchange value of the rupee, the possibility of silver appreciation continuing long, &c. Professor Hamilton supported Mr. Madan's opinion of not raising the value of the rupee and suggested the increased use of credit instead. But Dr. Slater kept to his position of raising the value of the rupee on the ground chiefly of the expected continuance of the high price of silver. The question is, indeed, a highly complex one and deserves the serious consideration of students of Economics.

The paper on the "Savings Banks of Mysore" sent by Mr. J. S. Chakravarthi was then read. It described the connection of the Savings Banks of Mysore with Village Bank and the Government Treasuries, and pointed out that the system was

facilitating the saving of small incomes by many villagers. Professor Bhattacharya then read a paper on the Indian Market which described at length the means of capturing the same after the war.

Then followed an informal talk among those present in the course of which were discussed new methods of co-operation especially the co-operative store system as run by the Triplicane Co-operative Store, and the Ranchi Co-operative Store conducted by the Jesuit Mission there. It may here be added that a similar co-operative store is working in Trivandrum.

The Conference concluded with short speeches by Professor Jevons and Professor Slater, in which they expressed their thanks to the Bengal Economic Association and to Professor Hamilton in particular for convening such a conference and hoped it would develop into an Indian Economic Association. They both remarked that this Conference would form a landmark in the economic history of India. Professor Hamilton responded with a short but feeling speech in which he pointed out the practical use of such conferences in the exchange of views. The Conference then dissolved. Next year's session will be held at Bombay.

*A Press Communique says:—*It is announced for general information that the address of the Indian Trade Commissioner in London is Winchester House, Old Broad Street.

*A Press Communique says:—*It is notified, for general information, that, in order to minimise the absorption by commodities which are not of importance in connection with the prosecution of the war of such exchange facilities as are available, the Government of India have decided to prohibit the export of pearls from British India. The prohibition will be enforced in the case of pearls sent either by freight or through the medium of the post.

ECONOMICS IN THE WEST.

Non-Ferrous Metal Industry Bill.

London, December 13, 1917.—As I am writing these notes the public here are discussing with considerable interest the measure known as the Non-Ferrous Metal Industry Bill. This is the first important legislative fruit of the famous Paris resolutions bearing upon the economic treatment of Germany. Under its provisions a rigid system of licensing traders in metals is introduced with the object of preventing essential metals produced in British territory from becoming the monopoly of foreign and especially of enemy trade combinations. Having regard to past experiences it is a comparatively mild solution of the problem of eliminating the influence of the German Octopus, but it has excited a suspiciously vehement opposition and there is every prospect of a rather stormy passage for the measure through Committee. There is little doubt, I think, that the hostility to the bill, so far as it is honest, is largely prompted by the growing fear that the commercial community has of Government control of industry. So much has been done in this direction already, and so far reaching has been the effect of official interference that a genuine dread has been excited of an after the war *regime* in which the existing conditions may become stereotyped.

STATE CONTROL OF INDUSTRY.

It is undeniable that the trend of political action and thought is towards a system in which the State will directly control industry in all its most important branches. Railways, mines and agriculture are plainly marked out for official direction of a kind which would have been deemed impossible before the war. Shipping too, will inevitably be brought very intimately into relationship with the State in the years which follow

peace. But it is, of course, in the domain of manufacturing industry that the principle of official control will find its most striking field. We have only to look around and note the thousands of munition factories scattered over the country, some of them huge establishments covering many acres of grounds and all of them almost equipped with machinery which is the last word in mechanical development and effectiveness to be aware of the impossibility of an immediate return to the old industrial system when the dogs of war cease to bark. None but an all powerful state could provide for the tremendous transition that there will be from the feverish activity of a war manufacturing era of unexampled strenuousness to the regular action of a period of peace in which the conditions for a time and probably for a considerable time will be chaotic. The State can keep these businesses running where private enterprise would fail: what is more by its measures it can make them profitable where the individual capitalist would find it difficult to make both ends meet. For example, immediately after the war the question of the supply of raw material for manufactures will become a pressing one. Every manufacturing nation will be at its wit's ends to find the wherewithal to keep its industries running. A strong Government like the British Government, with vast resources at its command and actual in control of important lines of supplies, will be in the position to feed its industries in a scientific way so that the worst features of the inevitable scarcity are eliminated. Again, a vast State organization such as is that of the Imperial Government, has it in its power systematically to feed its industries with orders for goods or material required for its manifold purposes. These are influences which in any circumstances would probably make State control after the war unavoidable. But the shipping difficulty absolutely clinches the matter. The tonnage scarcity

will be a serious handicap for years to come: immediately after the war it will be a complete bar to any really independent trade, for apart from the unprecedented demands which will flow in from every quarter for material to ensure the reinstatement of industry in its old position there will be a colossal movement of troops and material overseas, involving an endless procession of ships traversing the ocean for years.

State control of industry, then, is not a mere bogey but a real living figure already with us and gaining daily in vigour. It has the more virility because it takes upon itself something of the guise of a good fairy which may be able to point the way out of the most perplexing financial situation that this country ever found itself in. The war debt is becoming an absolute nightmare to financiers. Only this week the Chancellor of the Exchequer had to issue a solemn denial of a rumour—due doubtless to enemy suggestion—that repudiation was intended by the Government. The idea that the British Government, is likely to descend to the level of a fourth rate South American State and default is of course, absurd, and there are many who think that Mr. Bonar Law made a mistake in taking any notice of the slander on the national credit. But the facts that the *Times* has opened its columns to a discussion of the subject and that a prominent writer has suggested the desirability of the passing of an act declaring the inviolability of the War Department constitute sufficient proof of the nervousness that exists as to the future in monied circles. That the money to provide for the payment of interest and sinking fund of the debt will not be raised by normal taxation is fairly clear even at this stage when the war apparently has still a long time to run. It is, therefore, more than ever possible that a way out of the impasse may be found by an extension of the principle of the excess profits taxation. Logically there would be a good deal to be

said for an import in the immediate period after the war period when the trade boom which will almost certainly follow the war is running its course. More specially would such a system of taxation be justified if the Government gave protection to the industry, and possibly in addition found the necessary capital for it as well as fed it with indispensable raw materials and not less indispensable orders for goods. Such an outcome of the war would be strongly resisted in many quarters, but it is doubtful whether the public at large would resent a solution which took from its shoulders—directly at least—a portion of what will be the almost invaluable burden of paying for the war.

GROWING SCARCITY OF MINERAL OIL.

On previous occasions I have referred to the remarkable stimulus that the war has given to scientific discovery in the sphere of industry. In the last few days disclosures have been made bearing upon the production of fuel oil which bear out the view that we shall derive permanent profit of a marked kind from the investigations made during the war. The facts indicated are contained in a letter which Mr. Joynson Hicks, M.P., has addressed to the Press in reply to an inquiry for information as to the policy of the Oil Production Department. Mention is first made of the methods adopted for the production of oil from cannel coal. This description of coal we are told is or was thrown on the dump as an unsaleable product and yet when treated in resorts produces liberal quantities of crude oil. Ironstone, another product of the coal mines and one usually found in association with cannel coal is also an oil producer, the material having been found on experiment to yield about 25 gallons to the ton. Moreover, when this valuable oil has been extracted from the useless limestone a residue of about 40 per cent iron is left which has a value of its own. These are unquestionably important lessons derived from the research of the war period and though apparently the Government so

far has made little effort to put them to practical use they will not be overlooked by industry. The Indian coal fields probably in their existing stage would not profit greatly by the processes as oil is so accessible. But the day may come when natural oil will be at such a figure as to make the artificial production of oil a paying proposition even in the East.

On this subject of the growing scarcity of mineral oil a correspondent writes in interesting fashion in the last issue of the *Times Trade Supplement*. The writer points out that the existing consumption of oil for war purposes reaches almost fabulous figures. "According to one set of estimates that has seen the light Great Britain has called upon the United States for 2,000,000 barrels (say 300,000 tons) per month. According to another the demand is 350,000 tons per month. In quoting the smaller figure, American sources say that fourteen tank steamers will be required to transport it; but this is an underestimate, as the largest tankers afloat take only a maximum load of only 10,000 tons (say 110,000 barrels) and for 2,000,000 barrels eighteen such ships would be required. At first the colossal size of these figures makes them almost incredible; but they do not seem too large if one properly considers the vastness of allied operations on land and water and in the air. The air service alone will make a big hole in the monthly quantity. The writer in discussing the position of oil immediately after the war points out the various factors which will tend to make supplies difficult and predicts that the position will be "a supply of oil adequate but not too abundant, higher prices than in pre-war days, both for crude petroleum and for its products, fairly dear transport and an increasing demand of which no one can predict the full extent." Finally the writer makes the comforting statement that though at present we only produce 3 per cent of the oil we consume "within our borders lie vast stores, as yet

untouched, of petroleum and other mineral oils and if our destiny is rightly guided we are capable of becoming self-supporting in a future not far distant."

ECONOMIC STRESS OF WAR.

It is interesting to note even at this distance from the sphere of action how British Malaya is meeting the economic stress of war. The government's energies have been mainly concentrated on the problem of making the country more self-reliant more especially in the matter of agriculture.

First and foremost is the necessity of maintaining the local supplies of food for the native population. Rice is the staple article of diet. Malaya raises a certain amount of rice, but never in sufficient quantities to meet the population's requirements, and in some years the price of imported rice has risen to such an extent as to be a severe drain upon the native purse. In the past, the Government of the Federated Malay States has spent large sums to assist the native cultivators to produce rice in larger quantities, and the Krian Irrigation Works, in Perak, are a fine monument to the Government's efforts in this direction. Nevertheless, the need to import rice remains; and last year the value of this import into the Federated Malay States amounted to £1,691,983, only slightly less than in 1915 and by far the largest item on the import side of the trade statistics. Taking a wider view of this question, it may be stated that the whole of British Malaya—that is to say, the Straits Settlements, Federated Malay States, and Non-Federated Malaya States spends nearly twice as much upon imported foods, drinks and narcotics as it spends upon manufactured and partly manufactured articles. In 1916, it imported rice and paddy alone to the value of £7,671,224 and exported to the value of £4,618,559—the adverse balance being thus £3,052,665 compared with £2,722,162 in 1915.

To encourage the planting of foodstuffs and to increase supplies for local consumption,

the F. M. S. Government has approved of the following measures:—All restrictions with regard to planting tapioca and other foodstuffs on alienated land will be suspended. All land used exclusively for growing vegetables, bananas and pineapples will be given rent free for the next five years. This applies also to estates. Restrictions on the growing of foodstuffs on mining land will be suspended for five years. Restrictions on planting hill paddy (rice) will be suspended. Portions of reserves along the railway line will be let for the planting of foodstuffs.

Along with this paternal desire to provide locally for the immediate needs of the labouring population, steadily on the increase by immigration, the government of the Federated Malay States, through the scientific staff of the Agricultural Department, is seeking to promote the cultivation of other tropical products than rubber and cocoanuts. It is extremely unlikely in these days, when scientists are busy combating the foes of the tropical agriculturist, that the rubber industry should be overwhelmed by a similar disaster to that which ruined the coffee industry in Ceylon a quarter of a century ago; but it is a wise adage that cautions one against the placing of the whole of one's eggs in one basket, and so the F. M. S. authorities are extending their operations.

The last report of Mr. L. Lewton-Brain, Director of Agriculture, F. M. S., enumerates a number of crops which have been experimented with upon the various government plantations. Some of these are medicinal plants and trees, such as ipecacuanha, cinchona, eucalyptus, tuba, chenopodium, cananga odorata and carum copticum (which is a source of thymol). Others include tea, tobacco, cacao, coffee, maize, cotton (caravonica), the carnauba wax palm, the date palm, the African oil palm, and the trees from which candle-nut oil and Chinese wood oil are obtained. Three varieties of the African oil palm are being experimented with, and a few acres planted in December,

1912, are now yielding fruit. Several enquiries were received during the past year regarding the prospects of planting the African oil palm on a commercial scale in Malaya and assistance was given by the Department to those applicants. The experiment with cacao (*Theobroma cacao*) is being made on Gunong Angsi at an elevation of 25,000 feet. For this purpose an area of virgin jungle was cleared of all undergrowth and a number of trees felled and removed, leaving a sufficient number to provide partial shade. Cinchona, (from which quinine is obtained, and which has been successfully grown in Java) is showing very good growth on Gunong Angsi at an elevation of 1,500 feet and there is every reason to believe it can be grown successfully on the hills in Malaya. A consignment of dried ipecacuanha root, grown in the Experimental Plantation at Kuala Lumpur, was despatched to England for sale, and enquiries made regarding cultivation, preparation for market and other particulars of importance. The stock of ipecacuanha has been greatly increased by propagation of root cuttings, and is now being grown on the hill as well as on the flat under varying conditions. Considerable attention has been paid during the year to the possibilities of maize as a food product, and a large number of varieties from India, Burma, Java, Egypt, Australia, America and South Africa were experimented with, principally at Kuala Lumpur, Kuala Kangsar and Kuala Pilah. The experiments suffered greatly from depredations of pigs in the young stages and monkeys when the cobs were forming, and only results of a general nature were obtained. From the stand or plants it was evident that the South African varieties were by far the best under Malayan conditions, and actual yield-trials of duplicate 1/40 acre plots were in progress at Batu Tiga when Mr. Lewton-Brain's report was being written. It is clear, however, that as a supplementary food-crop maize has

higher possibilities in Malaya than was anticipated. The trials are being continued and records are being made by the Economic Botanist. Maize is one of the favourite incidental foods of the Malay, as is millet of the wild tribes.

British Malaya is especially rich in its varieties of fruits but with the exception of pineapples the export is not so large as it might be, if the cultivation and preparation for export were taken in hand more systematically. The total value of fruit exports last year amounted to £572,524 against £415,967 in 1915. A reference to the official statistics reveals the fact that 783,593 cases of pineapples, of a value of £515,098 were exported in 1916 compared with 810,839 cases in 1915, valued at £365,770. The pineapple industry is almost entirely in the hands of Straits Chinese, who deserve all the credit for its development. When Sir Hugh Low was Resident of Perak he not only planted the first rubber tree in that State, but he gave every encouragement to fruit culture, and showed an example by planting an orchard of oranges, citrons, lemons and limes at Kuala Kangsar.

ARNOLD WRIGHT.

The cost of power required in the manufacture of Portland cement reaches a higher percentage of the total cost of production than in most other industries. Investigations seem to show that, when properly operated, there is little difference in the power required by different types of machines used in the processes. Any reduction in the costs must be in the direction of the power used, and it is believed that electric power will materially reduce the expense of manufacture.

Mr. E. Plumbridge, fruit merchant, of Moorfields, E.C., and Fleetwood, Farnborough, left £100,273. There is money in fruit.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Simplified Storage Battery Charging.

Washington, D. C., U. S. A., 18th December, 1917.—The research laboratory of a leading United States electric company has recently perfected, after much experimentation, an apparatus for rectifying the usual alternating current for storage battery charging. The device makes use of a little bulb which, in general design, resembles an incandescent lamp. The bulb is mounted in a black japanned casing with a perforated top. This casing maintains a compensator which reduces the alternating current without using wasteful resistance, and also excites the filament of the bulb. In addition the casing contains a fuse to protect against reversal of the battery and other overloads. The rectifier is of 2-ampere maximum capacity and will charge various numbers of cells of lead battery. From a 115-volt, 60-cycle, alternating current supply, it will charge three cells at 2 amperes; six cells at one ampere, and eight cells at about 0.75 ampere, intermediate number of cells in proportion. The entire equipment weighs eight pounds.

WHAT IS A SPARK COIL ?

Spark coils are often referred to in writing about tractors, automobiles and gasoline engines in general, so it is no wonder that one is inclined to ask: "What is a spark coil?"

The spark coil is an instrument for increasing the strength of an electric current. The current obtained from a dry storage battery or a low-tension magneto is not powerful enough to leap the gap that exists between the spark-plug points, and the spark, or induction, coil is used to increase the voltage.

The core of the spark coil is made of a piece of soft iron or a bundle of wires.

Around this are wrapped several layers of coarse insulated wire. Surrounding the primary coil is another coil of finer wire. When a current of electricity passes through the primary coil a still higher current is produced in the secondary coil. One end of each coil is grounded. The free end of the primary coil is fastened to the battery, while the secondary coil is attached to the insulated terminal of the spark plug.

When the primary circuit is closed by the cam of the timer making connection with the timer contact point, the current from the battery flows through the primary coil of the transformer. This magnetizes the core, which draws down the vibrator blade, this in turn separating the platinum points of the vibrator and interrupting the current. As soon as the current is interrupted the core ceases to be a magnet and the vibrator once again flies back and closes the circuit through the platinum points.

The condenser is a device composed of layers of tin foil separated from each other by waxed or varnished paper insulation. This absorbs the excess current which is produced between the vibrator points. This current is induced by the action of the primary coils of wire upon each other and a reversed induction from the secondary coil. If this current is not taken care of it will impede the passage of the primary current and the sparks are apt to burn or pit the platinum contact points of the vibrator.

The spark coil is usually placed in a small, compact wooden box, and after all connections and windings have been made the whole is covered with melted wax. This holds the coils firmly in place and makes them immune to such vibration as naturally comes in running.

It is rarely that anything gets out of order about a spark coil. Sometimes the platinum points will get rough and stick together, but this may be overcome by removing the points and touching them very lightly with a file.

Sometimes the winding of the coil will burn in two, especially if a too strong current is used. When this happens a new coil should be purchased or the old one sent to its makers for rewinding.

A MOTOR TRUCK GRIST MILL.

A farmer living in the western part of the United States makes a one-ton motor truck play many parts. When he is not using the truck to move his produce to market he converts it into a farm power house. First, he jacks up the rear end of the truck. Then he blocks the rear left wheel so that it cannot turn. He takes off the tire of the right rear wheel, and a specially made, light wooden form fitted on the wheel carries a belt.

Thus outfitted, the power of the truck is used to saw wood, to cut up fodder and to grind feed. In the busy seasons this farmer grinds up a hundred sacks of feed a week, which he formerly had to take to the mill to be ground. He figures his net saving to be over \$ 6. 60 a day

Many other farmers are employing their motor trucks as stationary power plants when the machines are not required for hauling purposes. A word of caution on this subject may not be amiss: it is all right to use the truck for this purpose when care is taken, but to place too heavy a strain on the power plant may loosen the bearings and injure the differential.

PARTLY INFLATED PNEUMATIC TIRES.

The general practice among pneumatic tire manufacturers is to recommend their use in a well inflated state. It has been recently contended that this is a mistake, and that the maximum of economy, comfort, speed and safety is to be obtained by having the tires very slightly inflated.

It is indispensable, of course, that the rim of the wheel should never come in contact with the ground; but provided this limitation is observed the less inflated tire will absorb shocks better and there will consequently be fewer burst tires and broken springs and less

wear on the differential, to say nothing of the wear and tear on the owners feelings.

The criterion of the proper degree of inflation is to ascend or descend the sidewalk (as in entering or leaving the garage, slowly, and with the vehicle fully loaded) without having the rim of the wheel touch the curbstone. The tires can be deflated down to this point, and the pressure thus found correct can be subsequently maintained.

Another advantage of "soft" tires, it is said, is that they will not pick up nails and tacks, a fact verified by over ten years' driving over all sorts of roads. The analogy is pointed out as between a child's balloon and an inflated tire. Then the balloon is new and fully blown the slightest pin-prick will cause it to burst, while when partly deflated it "gives" before the pin, its resilience being such that it must be stretched or held taut before the pin will enter.

Of course, the soft tire has the disadvantage of causing more play by the rubber, with a consequent earlier loss of elasticity and shorter life. Many insist that this is more than made up for by the greater freedom from blow-outs and other accidents that might cut off the tire's career in its prime and by the lessened wear upon the car itself due to better shock absorption.

A DINING CAR DE LUXE.

For years it has been generally accepted that the final type of railroad passenger car has been evolved, at least as far as the general principles are concerned. Recent innovations on one railroad, however, show that there is still possibility of improvement in this respect.

One of the new cars is a "diner" that gives a considerable degree of privacy to the patrons. Instead of having a double row of seats and tables along the sides, the car has seven compartments down the middle of the car, separated by partitions, with a passageway on each side. The diners are thus screened from each other, and in view only of those who pass along the aisles, and

at the same time they have an unobstructed view through the windows. Each compartment has seats for four, and in an emergency six can be seated. Part of the compartments are so arranged, however, that a stained glass screen parallel to the sides of the car may be dropped, making a private compartment for two. The car is all steel, well ventilated and lighted, and otherwise up to the modern standards.

TEMPERING TOOL STEEL.

According to methods in vogue here at this time, the tempering of tool steel consists of two processes: hardening and drawing to a temper. When a punch or chisel has been shaped as wished, heat to a cherry red and dip in water until cool. The steel is then as hard as it can be made and it cannot be cut with a file. It is also very brittle, and a hammer blow will shatter it. If the tool is slowly and carefully reheated the hardness will gradually disappear.

After the tool has been hardened the temper should be drawn. Heat to a cherry red, and plunge the tool in water for a short distance, leaving hot a portion of the tool above the point. When the point is cooled the hot portion above will gradually soak down into the point, and if the tool is bright and smooth different colors will appear on the bright surface.

The first color to appear will be a pale yellow or a straw color, which will be followed in order by a dark straw color, brown, light purple, dark purple, pale blue and finally dark blue. As soon as the proper color appears the whole tool should be plunged in water. Tools of great hardness

should be tempered at a straw color; tools of soft steel should be tempered at a dark blue color.

STUDYING SCIENCE OF EVAPORATION.

Investigation of an important factor affecting weather—that of evaporation—is being undertaken by the United States weather bureau. While for a number of years the

weather bureau, of course, has been making some observations along this line, the past year marks the establishment of a number of evaporation plants at various stations in the country. It is now proposed to keep detailed records of evaporation at these places in much the same way as temperature and rainfall records. The department has also been making a study of the same problem in certain localities for some time past. At these stations two styles of equipment have been installed side by side.

For its new work, the weather bureau has devised a standard type of plant, which can be manufactured at low cost and which will insure uniform observations in all parts of the country. The main part of the equipment consists of a galvanized iron tank, four feet in diameter and ten inches deep. In order to provide an unruffled water surface when the measurements are taken a metal tube, or well, is kept standing in the tank. Of course, it is open at both ends so that water rises to the same height in the tube as it does in the tank, but naturally it is not affected by the wind. It is an easy matter to reach down in this tube with a measuring rod and get the depth of water. By taking readings at regular intervals the amount which has evaporated can be determined. Of course, in case of rain proper deductions must be made and for that reason a rain gauge forms part of the equipment. A wind gauge, or anemometer, is mounted at one side of the tank and maximum and minimum thermometers are also provided in an enclosed shelter.

The equipment used by the weather bureau, and occasionally installed side by side with the division of dry land agriculture equipment, has a device which records on a sheet of cross section paper the evaporation as it is taking place. At the end of a week the observer has a complete graphic record of the water loss from day to day. The tank used with this equipment is about three to four times as large as the standard weather

bureau tank, and is placed in a depression so that the top is on a level with the ground.

GREATEST YEAR IN MINING.

Probably no year in the history of the United States showed greater progress in the mineral industries than will the present one, according to officials of the Bureau of Mines. Although this progress was undoubtedly stimulated by the war in Europe, which is causing extremely high prices for some of the metals, yet the fact remains, it is pointed out, that mining is being regarded more as a business and less as a speculation, and the benefits of business methods are becoming evident.

Those who are in close touch with the mining industry at the bureau say that practices that were almost universal a few years ago have been largely abolished, the mining public has been brought to recognize the folly of wasteful and dangerous methods, and there is a unanimity of opinion in regard to the conservation of life and health, as well as of our mineral resources. Besides, the people of the United States realize more fully than ever before the extent and value of the country's resources and the possibilities that await intelligent and well-directed efforts at utilization.

In the past economic reasons caused deposits of valuable metals and industrial materials to lie idle; commercial reasons, many of them not truly economic, led to the waste of valuable constituents in many ores; the recovery of minerals from the ground was too often incomplete and accompanied by incalculable loss, and the treatment of ores in mills and smelters saved altogether too low a proportion of the metals sought.

Now, it is said by those who know, better methods are being tried on every hand, and the unparalleled record of the year is largely due to the success of these efforts.

The Bureau of Mines is endeavoring to increase the safety and health of workers in the mineral industries and to promote greater

efficiency and the prevention of waste in the mining, preparation and utilization of the mineral resources of the United States. Although many difficulties have had to be overcome, it is believed that the work accomplished by the bureau has kept pace with the progress of the mineral industry as a whole. The increase of efficiency and the lessening of waste, quite naturally, are of high importance in mining, and investigation with these ends in view have been furthered to the utmost, but such work, it is pointed out, must come second, when there is opportunity for work that will increase safety and health of the workers in mines and mills.

TEXTILE PLANT FIBERS.

The United States Department of Agriculture sets forth some interesting facts regarding the present urgent need of a greater production of textile plant fibers and the steps that are being taken to supply such material. The shortage is due to the reduced production of flax and hemp in Russia and jute in India, together with difficulties of transportation and increased consumption. Flax is not now regarded here as absolutely necessary for table-cloths and napkins, and has long since given place to cotton in most so-called linen collars and shirts, but it is needed for the wings of airplanes and must be largely used in shoe thread. Ireland's 107,000 acres of flax, double the area devoted in former years, and the increase of 40,000 acres in Japan are helping out the supplies, while hemp and cotton are used more than ever before as substitutes. The price of hemp has increased from 6 cents a pound to 16 cents. In the United States the acreage in hemp has increased from 4,000 to 41,000 in the past three years. Jute, normally used to a greater extent than any other fiber except cotton, is nearly all produced in India, where the crops of the past few years are said to have been deficient. The most promising substitutes for this fiber are low-grade hemp and flax. There is a shortage of henequen (Yucatan sisal) for binder twine, and the best substitute now available in this country is American-grown hemp. The fiber scarcity has one bright side: it has made American spinners appreciate the possibilities of American fiber as they have not done heretofore.

ALFRED T. MARKS.

NOTES.

According to the Annual Report on the working of Co-operative Societies in the Punjab for the year ending July 31, there has been a net increase of 98 in the number of agricultural societies, sixteen of the new societies being in the Muzaffargarh district. The progress of the movement in the backward districts of the south-western Punjab will be watched with special interest. The Lieutenant-Governor fears that the condition of economic servitude of the rural debtor to the village money-lender is far too prevalent in these districts, and he agrees with the Financial Commissioner that salvation is to be found, in the extension of co-operative credit rather than in the Insolvency Court, the procedure of which under the present law tends to encourage extravagance and dishonesty rather than thrift and honourable dealing. In future reports special reference should be made to the progress of the movement in the Lower Bari Doab colony where the condition among the tens of thousands of new colonists, most of whom need capital at the start, may demand special measures. So far only eighteen societies have been formed in Montgomery and ten in Multan. The share capital of agricultural societies shows an increase of $4\frac{1}{2}$ lakhs, the result of greater insistence on prompt payment for shares. The total share capital now amounts to nearly forty-seven lakhs of rupees, in spite of the transfer from share capital to deposit of the share money of the 12,000 excluded members. The reserve fund stands at very nearly the same figure as last year (2u7 lakhs); this with the share capital forms 56 per cent of the total working capital of Rs. 1,32,30,000, so that the societies offer excellent security to central banks. Many societies have now been in existence for ten years. One of the original institutions in the Multan district is now able to give loans without interest, a fact which, as Mr. Calvert

observes, should be of great interest to Muhammadans. In Gurdaspur the profit for the ten years has been generally between 60 per cent and 80 per cent of the share capital and fourteen out of thirty-six societies now find their own capital sufficient for their needs. Sir Michael O'Dwyer sees in such results satisfactory proof of the claim that the co-operative movement is working steadily and successfully towards the economic emancipation of the zemindar. Non-agricultural societies have increased from thirty to thirty-seven, but with the exception of a few Weavers Associations they cannot be said to be successful. Lack of education and of the mutual confidence essential to co-operation are the chief obstacles to progress. The philanthropic and religious societies which have interested themselves in the reformation of the criminal tribes would find a useful sphere for their activity in the encouragement of co-operation among the menial classes but only one instance of such help is quoted in the report, and this appears to have been spasmodic and consequently unsuccessful.

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The report of the Department of Agriculture, Bengal, for the year ended June 30, shows that in Eastern Bengal the department has been short handed and, in consequence of the depletion of the export staff, no original work could be undertaken. One of the most interesting features of year's work was the distribution in the Dacca and Mymensingh districts of small quantities of the Kakya Bombay jute seed and Indrasail paddy seed through panchayats to cultivators. This represented the culmination of a careful survey of many years during which the qualities of over 2,000 varieties of paddy and 500 varieties of jute were tested with reference to their yield and hardihood. The growing demand for the seed of these two varieties has been fully maintained and arrangements are being made for distribution

on a large scale in the coming year in the districts of Eastern and Northern Bengal. Other important work effecting the eastern districts is the discovery of the manurial value of the water-hyacinth. The investigations of Mr. Finlaw, a fibre expert, have already resulted in the sale of about seven hundred and fifty tons of hyacinth as representing a destruction of about 75,000 tons of the green plant. In Western Bengal there has been a marked increase in the area under groundnuts in the Birbhum district. The use of bone meal manure is reported to be making some headway in the western district. Further knowledge has been obtained on ufra, the disease which causes serious ravages in the deep water winter rice crop of several districts in the Dacca and Chittagong divisions. It has now been established that all kinds of rice are equally capable of developing the disease under favourable conditions but deep water winter rice is particularly susceptible. The advice previously given to burn the rice stubble completely as soon as possible after the harvest still holds good but the report admits the difficulty to give full effect to it. The sericultural branch of the department continued to work on the same lines as in previous years. There was a marked advance in the price of seed. Cocoons increased from Rs. 16,828 to Rs. 28,737. The expenditure on the nurseries amounted to Rs. 91,361. It appears that the existing methods for detecting pebrine in the silk work moth are of doubtful efficacy and arrangements have been made to try a new and more accurate method.

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A short time ago it was stated that Messrs. Tata, Sons and Co. of Bombay had embarked upon a big industrial enterprise based upon business taken from Germans who had made a monopoly before the war. A company with Rs. 75,00,000 has been floated by them to develop the cocoanut industry in Southern India and Ceylon.

Of this amount Rs. 50,00,000 have been issued and it is understood that one-fourth of the amount is available for allotment in Ceylon, and that in all 12½ lakhs have been subscribed. Mills will be started in Ceylon and Mr. E. B. Thompson, expert in the cocoanut industry, who has already established several such mills in the Phillipines, is in Colombo at present for this purpose, and it is understood that negotiations are in progress for the site. The machinery belonging to Messrs. Frudenberg is obsolete and new and up-to-date machines will be got from America. The mills, it is understood, will be able to deal with about a fourth or a third of the whole output of Ceylon oil. One of the improvements of the new establishment will be the elimination of trouble over barrels, for arrangements will be made for tank steamers to convey the oil direct to its destinations. The German capitalists made large fortunes out of this industry both in Southern India and in Ceylon, and the present venture promises to play an important part in the industrial development of both countries. Valuable concessions have been granted by the Indian Government and similar treatment is expected in Ceylon. The establishment of such mills will improve the present prices of copra and after the war, when there will be a demand from every quarter and the freight question is overcome, a boom in copra may be expected.

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Graphite, the discovery of which in Mysore was mentioned recently, has been traced to some part of the Mysore District, while near Bangalore it has been found as micaeous-looking spangles in a white quartzite, or fine-grained quartz vein in gneiss. It also occurs associated with some of the auriferous quartz of the Kolar Gold Field in some workings from "Trial" shaft, Nundydroog, on what is supposed to be a continuation of a Oriental lode. In this case, the selvedge edges of the vein and

some of the joints or cracks along which movement has taken place, are freely coated with graphite. To the north of the Kolar Field, some fine-grained graphite schist occurs near the old working at Manighatta, and somewhat similar material has been found in Chitaldrug and on the scarp of the Bababudan Hills, near Hoskan. In the last instance, the schist appears to consist of fine-grained chlorite or talc, with finely divided quartz and iron ore, the whole being penetrated by short lenses and veins of white quartz on the edges of which the graphite is somewhat concentrated.

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After a considerable amount of research in order to ascertain the commercial prospects of such an enterprise, the New South Wales Government Water Supply and Irrigation Commission has undertaken to establish a large fruit preserving and canning factory at Yanco, the centre of the Murrumbidgee irrigation area, 367 miles south of Sydney. The carrying out of the project will include the provision of buildings (now being erected), equipped with modern appliances, and the installation of a complete plant for making tin cans. The total estimated expenditure is placed at £90,000. A representative of the Commission has been enquiring into the latest methods of canning and packing fruit in the United States, with a view to making arrangements for the purchase in that country of the machinery and equipment required for the undertaking. Mr. Milne adds that it was not considered that United Kingdom manufacturers would be in a position to supply the Commission's immediate requirements for plant and equipment under the existing unsettled conditions, but that it might be advisable for firms interested to inform the Secretary of the Commission as to their products, with a view to future business. The address of the Secretary is Perpetual Trustee Buildings, Hunter Street, Sydney.

As the outcome of negotiations between the shippers of raw silk—the principal export from Japan—and the Japanese shipping companies, an arrangement has been made regarding freight rates for consignments of raw silk from Yokohama to the United States of America. Under this arrangement the shippers guaranteed to ship a minimum quantity of 100,000 bales from August to the end of December, and the shipping companies agreed to accept during the said period a maximum quantity of 120,000 bales; while as regards the freight rates, a rate of 5 dols. (gold) per 100 lb. was fixed for shipments during September, to be advanced to 7 dols. (gold) per 100 lb. for shipments from October to December. An agreement to this effect was signed by the shipping companies and the principal shippers of raw silk; the arrangement was also agreed to by foreign shippers of the product. His Majesty's Commercial Attaché adds that this arrangement is similar to that effected earlier in the year in respect of tea, when the Japanese shipping companies agreed to carry to Trans-Pacific destinations certain specified amounts of tea at the fixed rate of 18 dols. (gold) net per ton of 40 cubic feet. This was a flat rate, to be charged on both subsidised and non-subsidised ships, instead of the varying rates which had previously been in force. Dollar (gold) = 4s. 1½d. (at par rate).

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The formation of two Japanese companies has been projected for the purpose of engaging in the sugar industry in the Netherlands East Indies. At the time of writing, the plans for the formation of one company were well advanced, and it is understood that the Soekesedjo mill at Soerabaya has been purchased for this concern. The other company is being established for the purpose of purchasing sugar companies and suitable cane-growing lands in Java and Sumatra. The capital of this company is stated to be

6,000,000 yen (about £612,000 at par value of yen) ; the company has already purchased a sugar state in Sumatra, and a tract of land in Java which is to be brought under cane cultivation, in addition to buying out a Soerabayan sugar company. Manufacturing operations will be commenced with a plant having a daily capacity of 300 tons, which it is intended to increase later to a capacity of 1,500 tons. The large dividends at present being paid by the Formosan sugar companies are mainly responsible for the establishment of new companies to engage in the sugar industry. In addition to the two companies already mentioned, several other Japanese companies have been formed during the past year. Three such companies, two of which intend to operate in Corea and one in Mukden. Another company is being formed for the purpose of cultivating sugarcane in the islands south of Japan, and in the Loochoos. In addition to its sugar operations, this company intends to manufacture starch from sweet potatoes, and to run shipping services between the islands. While the prospects of success in the sugar industry are excellent at present, it will be interesting to observe, what will happen when the war comes to an end. Sugar consumption in the Far East is undoubtedly growing, but Japan is much affected by the present sugar consumption tax, and it will be many years yet before the sugar industry can stand on its own feet, under normal conditions.

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We showed some time ago, writes the *Pioneer*, how important apart the products of Indian forests were playing in providing for the requirements of the war. Large quantities of Indian timbers are being shipped to Mesopotamia, Egypt and Salonika, and in a handbook issued by the Munitions Board Mr. R. S. Troup, Controller of Timber Supplies, now gives further information respecting the use of Indian woods in the manufacture of aircraft. The woods specially used in Europe for this purpose are spruce,

ash and walnut, as well as other varieties in the form of three-ply wood. Owing to the exigencies of the war steps were taken to search the Indian forests for substitutes for these woods. Many Indian timbers, it appears, are suitable as regards strength, but where specific gravity requirements are defined within narrow limits the range of choice is restricted. Some of the woods have actually passed the strength test satisfactorily, though, according to Mr. Troup, most of them cannot be finally accepted until they have been submitted to searching practical trials. The Himalayan spruce, silver fir and blue pine, have, however, proved to be efficient substitutes for European spruce, and large supplies have accordingly been arranged for. Further, the Himalayan walnut is the same species as the European walnut and supplies of the former are being obtained, though the scarcity of this timber will necessitate the employment of suitable substitutes when they are found. Measures have also been taken by the Forest Research Institute to find substitutes for the walnut used for rifle manufacture. This has apparently proved to be a more difficult matter, but two varieties, the white *chuglam* of the Andamans and the *bijasal* of the Indian Peninsula, have been pronounced provisionally to be suitable and rifles made with these woods are to be tested under service conditions. The war has had the effect of giving a pronounced stimulus to the exploitation of Indian forest products and the activity in this direction now displayed emphasises the neglect which has been shown in the past.

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We called attention recently to the great efforts of Japan to capture the Eastern trade hitherto in the hands of the manufactures of Central Europe. Her recent bargaining with America to hand over to the latter what shipping she could spare in exchange for steel is a proof of her well-organised plants for the development of her iron and engineering industry for that, as well as other

purposes. But apart from the businesslike Japanese activity, there is another raising competitor nearer than Japan, and fortunately within the British Empire, but of whom nevertheless careful note should be taken by the manufacturers and trade unionists in the United Kingdom. It is India, whose production of iron and steel is now large enough not only to supply the requirements of the country, but to send a fairly large amount to Australia and the Far East, where Indian brands are beginning to be well known. The principal customer is Japan; whilst in the financial year 1915-1916 the Indian Government took 85 per cent. of the output of the Tata steelworks alone for munitions. But apart from her potentiality in iron and steel, India is also progressing in the engineering industry, and in a short time will be able to supply a great part of the agricultural machinery and implements needed annually for the cultivation of her own vast lands, and perhaps of other Eastern countries. One of the latest indications of India's progress in her entrance into the motor manufacturing industry. A well-known Calcutta firm, we hear, has turned out a vehicle which has been built throughout in that city. Japan has also made good progress in motor manufacturing. The question therefore arises to what extent India, with her cheap and abundant labour and inexhaustible supplies of raw materials, and Japan will be able to compete with British trade in the Near, Middle, and Far East. This question must be seriously considered by British manufacturers.

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The *Frankfurter Zeitung* announces a further large increase in the nominal capital of the German aniline dye concerns. It will be remembered that in the summer of 1916 all the important concerns were united in what is practically one syndicate. The seven largest concerns already have a capital of nearly £12,000,000, and it appears that additional capital is now to be raised to the

amount of about £7,500,000, so that the total capital will not fall far short of £20,000,000. Definite details are not yet forthcoming, but it is known that the three largest concerns—Hoch ochster Farbwerke, Badische Anilin and Baye—are each to increase their capital from £2,700,000 to £4,500,000. At the same time it is stated that the increases of capital by the undertakings themselves by no means cover the actual expenditure on the expansion of the works, and that large additional sums will still be provided by the German Government. The utmost determination to maintain German predominance in aniline dyes is still expressed. The *Frankfurter Zeitung* says in the course of its article:—The chemical industry plays a most prominent part in the extraordinary striking force which Germany has been able to develop in the world war, and in the strong superiority which she has been able to win over her enemies on the fields of battle. During the war very special tasks have fallen to the chemical industry, and it has been able to solve them because of its brilliant productive efficiency its manufacturing and financial strength, and the great adaptability of its works. The *Frankfurter Zeitung* also observes that the German banks and the German mining industry alone employ capital on the same sort of scale as the dyes industry.

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In the course of a lecture on "The Sun as Empire Builder," recently delivered to a meeting of the Royal Colonial Institute at the Royal Society's Lecture Theatre, Burlington House, by Colonel H. E. Rawson some remarkable instances of the sun effects on plant growth were illustrated. Instances of variations in plant life under different conditions of light and environment had led Colonel Rawson to make experiments in his own garden and conservatories, and remarkable results were illustrated on the screen. He had developed a system of controlling the incidence of light, which in the case of

the nasturtium had changed the colour and formation of the flower and had caused the simply-shaped leaf to divide and to show as many as five lobes. Several of these variations had become fixed and came true from seed. Experiments with tomatoes had increased the production of fruit, and he anticipated that by attention to sunlight our fruit supply would be greatly augmented. As to colour, the law seemed to hold that the low sun of early morning fostered yellow, midday sunlight produced violet, blue and purple, and middle sun brought out reds. Roses and crops need not suffer from certain diseases and pests if influenced by the particular rays that would keep them healthy. Plants attacked by black aphides, which notified the presence of disease, had been entirely relieved by selective screening. Hopeful experiments were being made with a view to showing that certain human diseases supposed to correspond with those of plants might be cured in the same way. The lecturer believed that the mystery as to what first caused variations in plants was cleared away by these proofs of the influences of light.

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The recent issue of the *Fortnightly Review* contains an open letter by Mr. Oswald Stoll addressed to Lord Milner in which the writer advocates his theory of the popularisation of public credit for the benefit of the general industrial community, taking for his text Lord Milner's "England in Egypt." "Our present and future obligations," he says, "are really crushing." I will again quote from your book and say: 'By far the most effectual way of ultimately lightening that and every other burden of the people is to develop still further the productive powers of the country, and perhaps the Empire.' Now, just as the high native authority, whom you quote, once said: 'If your object is the prosperity of Egypt create a reservoir,' I say to you: If your object is British prosperity open freely

to the British industrial community the existing reservoir of British credit. You have said: 'Egypt is a country which cries aloud for the application of capital to elicit its great latent wealth.' So the whole field of British industry in its perilous condition of increasing obligations and denudation of resources cries aloud for the application of the equivalent of capital not only to elicit its great latent wealth but also to prevent a terrible impasse. The proposed activities of small groups of financiers will not do. There is much more to be done. Fixed productive capital is the vast reservoir already created which holds a wealth of British credit which can be to the British industrial community what oil sent through pipe lines is to Rockefeller, or water from Assouan to the controllers of the Nile delta. You said of Egypt: 'The question of creating a vast reservoir to collect the river water in the months of abundance, in order to give it out again in the months of drought, is therefore the most interesting problem, which now confronts not only the engineers, but the financiers of Egypt.' In our case the vast reservoir exists in the form of credit system and its implications; the engineers and the financiers have long had a monopoly of its productive waters. There is enough for them still, and they are welcome to it. But more must be added in both quantity and quality and liberally distributed among many others who can establish a right to it."

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The synthetic production of India rubber appears to have got beyond the laboratory stage in Germany, and is now being worked on a commercial scale. The basis of the process is, apparently, acetylene, which, by the addition of suitable re-agents is first converted into "isopren," and the conversion of the "isopren" into rubber is accomplished by the method worked out by Hofmann, using a suitable catalytic agent.

GLEANINGS.

Germany's systematic preparations for the coming trade war have often been pointed out in these columns. Her commercial strategy to regain and hold the markets in the Near East is evidently based on the same financial plan which in past years enabled her to predominate in those markets. It was the establishment of a considerable number of German banks and banking agencies in Asia Minor that enabled German manufacturers to have an easy and speedy success in that region. Landowners, masters of industry and users of machinery, notwithstanding the prevailing prejudice against German machinery, found sufficient inducement in these banks to give their orders to German manufacturers. The transactions were safe, and both buyer and seller were satisfied with the mediation of the bank. Some idea of the preparations Germany is making to push trade in Roumania and Southern Russia is furnished by the fact that the Deutsche Bank has just decided to raise new capital to the extent of twenty-five million marks with the intention of opening branch offices and agencies in the countries named. Official sanction for the new scheme has already been sought from the Government.

Decrees levying sundry stamp taxes that are expected materially to contribute to the financial strength of Greece have recently been promulgated by the Hellenic Government, says the United States Consul-General at Athens (Mr. Alexander W. Weddell) in a recent report. A tax stamp must now be affixed to all letters, money orders, parcels passing through the post, telegrams, railway tickets, bills of lading, tickets to theatres and other places of amusement where an admission fee is charged, receipts for money paid, petitions, Custom House papers, authentication of signatures by notaries public

programmes, advertisements when exposed to public view on separate cards or sheets, posters, and all bills in restaurants, hotels, tea rooms, coffee shops, beer halls, and wine shops where food is served. In addition, a 3 per cent tax is to be collected on the annual income of every church, and one of 5 per cent. on the annual income of every monastery in the kingdom. Three per cent, will be collected from the incomes of persons in the Government service. Penalties are provided for violation or wilful evasion of this tax.

An estimate of the world's output of gold in 1916 published earlier in the current year placed it at rather more than £99,000,000. A revised statement issued in New York shows that the total was £94,088,000, which represents a decrease of £1,638,000 as compared with 1915 but is £2,069,000 more than the output of 1914. The possession by the British Empire of the most valuable goldfields in the world has been most valuable during the present war and it is gratifying to note that the production of the Transvaal mines in 1916, which amounted to £38,428,000 was £1,207,000 more than in the previous year. The value of the gold output of the United States in 1916 was £18,463,000 a decline of £1,744,000 and that of Australia £7,643,000, a falling-off of £1396,000, while the Russian production at £6,950,000, derived principally from Siberia, showed a slight decline. In recent years the expansion in the world's output of gold has been enormous, the total for 1916 being practically double that of twenty years ago.

Mr. Thomas Edison, the noted American inventor, states that he can produce thin sheets of steel, copper, or nickel that would, so far as books are concerned, serve every purpose for which paper is now employed. Mr. Edison considers nickel to be the best metal for this

purpose, and states that they can produce sheets only one twenty-thousandth of an inch in thickness, and these will be cheaper, tougher, and more flexible than ordinary book paper. In the Edison Laboratory a sheet of nickel paper with an area of five square feet can be produced within a minute and a half, but for ordinary commercial purposes the material would be made in long rolls, as is now the case with paper. The advantages of the metal sheets include non-inflammability, the capability of being soaked in water without damage, and a vast reduction in bulk when compared with paper, as a single small volume could contain many thousands of leaves.

The interim report of the Select Committee on National Expenditure was the subject of comment at a recent meeting of the Empire Resources Development Committee. The report affirms that even if the present rate of expenditure does not increase, and if the amount met from revenue proves to be in accordance with the estimate for 1917-18, each six months of the war will now necessitate a gross addition to the debt of about £1,000,000,000, or a net addition of about £750,000,000, if advances to the Allies and Dominions remain at their present level and are deducted from the gross debt. The Empire Resources Development Committee holds that, in view of these disquieting figures, its policy of paying off the debt by the development "by the State for the State" of the Empire's vast resources, rather than by burdensome increments of taxation, should command the immediate attention of the authorities.

The following is taken from the Report on the Administration of the Madras Presidency for the year 1916-17:—At the instance of the Hon. the Surgeon-General, an effort was made to revive the cultivation of drug plants. The work of improving the turf was

continued in Sim's Park, a quantity of jungle was cleared, an endeavour was made to cover the bare stems of trees with climbing plants and new species of trees were planted. The orchard was greatly extended and a number of fruit trees imported from Australia. The mangosteen crop in Burliya was a record one. The cocoa trees also produced good crops of fruit and the beans were sold to the East India Chocolate Factory. It is believed that this is the first time that cocoa and chocolate have been grown and manufactured in India. The Para rubber trees at Kallar were tapped and rubber valued approximately at Rs. 500 was collected.

The total production of wolfram from all sources in Burma for 1916 is reported to be 65,824 cwts. as compared with 46,293 cwts. in 1915; and 43,752 cwts. in 1914. These figures exclude production from the Southern Shan States, where, owing to the wolfram being worked in conjunction with tin, separate statistics are not recorded in respect to the output of each ore. The steady increase in the total production during the last five years is satisfactory but there is every indication that there will be a more substantial increase in future years. Up to very recently large capitalists have held aloof from the industry, but the facility with which certain owners have been able to develop their mines from revenue has attracted attention and several British firms of considerable financial standing now exercise options over certain mines.

To obtain hot water practically as quickly as electric light by turning a button is the purpose of a new device in the electric heating field. It is an electric heating attachment which can be easily and quickly attached in place of the ordinary cold-water spigot, and which, it is claimed, will give water from warm to hot, as desired, within three seconds after the small button or switch

is turned. In operation the apparatus is extremely simple, the same motion controlling both water and electricity. The water will continue to run from the heater as long as wanted. The apparatus weighs less than two pounds, and takes its electric power from any convenient electric socket.

The oldest and largest of the Canadian banks—the Bank of Montreal—celebrated its hundredth anniversary last month. The institution was established on 3rd November, 1817, its formation being due to the retirement by the British Government of their Army bills issued to meet the expenses of 1812 with the United States. It is one of war the the few institutions still remaining which have seen Canada rise from a series of disconnected and poverty-stricken colonies into the great Dominion which forms the largest single unit of the British Empire.

A method of making cheese from a curd containing over 60 per cent. of potato was a own by Mr. William Lawton at the office of the Britannia League of Housewives, 1, Upper Montague-street, Bloomsbury. No expensive aparatus is needed, and it is claimed that the housewife if she follows the instructions will be in a position from a few pounds of potatoes and a small quantity of milk and extracts to make her own cheese at half the present price.

The synethetic production of India rubber appears to have got beyond the laboratory stage in Germany, and is now being worked on a commercial scale. The basis of the process is, apparently, acetylene, which, by the addition of suitable re-agents, is first converted into "isopren," and the conversion of the "isopren" into rubber is accomplished by the method worked out by Hofmann, using a suitable catalytic agent.

An announcement has been made, says *Indian Industries and Power*, by the Tokyo

Kisen Kaisha that the firm will inaugurate a line to Calcutta with Kobe as the terminus in Japan. Its service will be two ships monthly with three ships in commission at the start. Among the ports of call decided on are Kobe, Hongkong, Singapore and Calcutta, and the line may probably be extended to Rangoon later.

The question of liquid fuel for locomotives is attracting attention in Ceylon and a Colombo contemporary publishes an interview with a well known engineer on the subject. Liquid fuel, it is urged, would be considerably cheaper, say one-third to half the cost. Officially, however, the proposal is not regarded very favourably in view of the failure of a similar experiment at Home.

American shipyards, it is said, will be kept in full operation for the next ten years in order to provide the immense fleet needed for the increased international trade after the war. For the first time in sixty years American shipyards are said to be equalling British shipyards in output.

Gas is now in use in Bombay for gold melting; soap boiling; brazing and every conceivable purpose for which heat and power are required; since it is found the heat can be regulated to a nicety impossible with solid fuel.

It is reported that the French have discovered a substitute for cotton, obtained from a plant called typha, which grows in marshland and swamps. The experiments with the plant are said to have been satisfactory.

In view of Professor J. C. Bose's services to the nation the Calcutta Corporation has resolved that the Bose Research Institute shall be exempt from all rates and taxes.

Shipments of graphite from Quebec during the past year amounted to 376,390 lb., valued at over £ 15,100, against shipments valued at under £ 500 in the previous year.

TOPICS FROM ECONOMIC PERIODICALS.

AGRICULTURAL CONFERENCE.

Sir Claude Hill's Speech.

H. E. Lord Willingdon opened on 10th December last the 10th annual meeting of the Board of Agriculture. In his opening speech he said that he had been struck by the Magnitude and variety of agricultural problems in India. He was much struck by the progress made during the last decade, but they still wanted men who could grow crops to perfection and knew how they could do it at the least cost. He wished to see such men emerging from the rank and file in ever increasing numbers. Referring to the breeding of pedigree stock, he said in levelling up the standard from the worst to the best, which the country now produced, they had before them work which would produce direct and indirect results in every branch of Indian agriculture.

Sir Claude Hill's addressed the Conference as follows :—

I think the Board of Agriculture may consider itself extremely fortunate in the circumstances in which it is assembled here in Poona. This is the fourth occasion on which a meeting of the Board has taken place away from Pusa and, though we hope that alternate meetings will invariably be held at centres other than Pusa in future, we cannot hope that, at all events for some years to come, we shall meet in such auspicious conditions as to-day. This is the first occasion on which the head of a Province has ever consented to preside at a meeting of the Board. This itself would mark the occasion as special and as one giving special cause for encouragement to us who are concerned in promoting the welfare of agriculture in this vast country. But I suggest to you that the present occasion is deserving of special note, because not only is the head of a Province presiding to-day, but the Governor of a Presidency, and not only the Governor of a Presidency, but H. E. Lord Willingdon. I had great hesitation some months ago and felt that it might well be regarded as presumption on my part, to invite His Excellency to preside on this occasion,

because, was so well aware of the incessant calls upon His Excellency's time. I also know, however, not only that His Excellency is one of those men who devote their whole time to the public good, irrespective of, and without consideration for, personal convenience, but also that he had that peculiar capacity of always finding time to do that which is worth doing, and I took it upon myself to assure His Excellency that the encouragement which he would give to all of us by consenting to preside here to-day was indeed worth while from the point of view of the development of the main resource, *i. e.*, agriculture, upon which the welfare of this great Empire depends. Lord Willingdon, with that willingness to incur additional work which is so characteristic of him, at once agreed to preside. It is true that I was able to appeal to a side of His Excellency's many interests which I thought would be a peculiar attraction to him, for, as you all know, His Excellency has shown a very special interest in agriculture from the time of his landing in Bombay. So far as opportunity has offered, he has, I know, also encouraged every venture for the development of agriculture which Mr. Keatinge has been able to put before him and to justify, and His Excellency himself has set an example to all wealthy landowners in India by organising and establishing a stud farm of Indian cattle and a dairy on model lines. It was, therefore, I knew, the case that a meeting of the Board of Agriculture might be supposed to appeal more strongly to His Excellency's interest perhaps than any other department of work. Nevertheless, I feel, and I know you will all feel, that we owe Lord Willingdon a very hearty vote of thanks for consenting to be present here to-day and to open our proceedings, and I know that I may assure him of your appreciation of the self-sacrifice which he has displayed in coming here. I hope that his example may be followed hereafter by other Governors of Provinces and that by that means the public at large may come to have its interest developed in the great industry of agriculture.

I hope His Excellency will not regard it as presumption on my part, if I add my own personal thanks to him for complying with my request.

HORSE BREEDING.

Before turning to the list of subjects for discussion by the Board and the Committees of the Board, I would like to refer to one matter of general interest which impinges upon the activities of the Agricultural Department. I refer to the prospective development of horse breeding in this country. The matter has come very prominently to notice lately at Delhi, in connection with the Chiefs Conference, when, with the help of General Templer arrangements were organised by which those Chiefs

who were specially interested in the subject were given an opportunity of visiting the Remount Depot at Babugarh. I know that several of the Chiefs who went there were very greatly impressed by the possibilities which were opened up before them for reviving and developing the indigenous breeds of horses in India. We are not directly concerned with horse-breeding, but we are indirectly interested in the operations of the Remount Department, in as much as incidentally to the operations of that department, there have been considerable development in connection with agriculture. One of the first tube wells sunk in India was sunk at Babugarh. Experiments connected with the rotation of crops and with cultivation of wheat and oats have been undertaken in the Punjab, at Poona and Sargodha, under the advice and with the assistance of the agricultural authorities at the Lyallpur College. India must be more self-contained in the matter of the provision of horse-flesh than she has been in the past and less dependent upon overseas importations. I am given to understand that the military authorities contemplate the necessity of duplicating the Ahmednagar stud somewhere in the Deccan, and I venture to hope that just as the Agricultural Department and the Remount officers in the Punjab have mutually benefited by mutual help, so, when developments take place in the Deccan, agriculture may profit as well as horse breeding. At all events, I am quite confident that the Remount Department may rest assured that the Civil Veterinary Department and the Agricultural Department will whole heartedly co-operate with any measures which the military authorities may find it necessary to concert.

Since we last met, agriculture in India has suffered an altogether irreparable loss in the lamented death of Professor Barnes, who died very shortly after his selection for the post of Imperial Agricultural Chemist. Mr. Barnes's attainments are known to you all. His reputation was not confined to India but was world-wide. I know that we had all looked forward to a development of agricultural chemistry in India under his direction which would have had far-reaching results. His death may be said to have been almost directly attributable to his whole-hearted devotion to work, in as much as he had consented to postpone leave, which, on the grounds of health, was urgently needed, for the sake of taking up and prosecuting the work in his new appointment. I think that you will all wish that we should pass a resolution of the full Board of Agriculture in India, expressing our deep sense of the loss which the cause of agricultural development has sustained in his death and that we should convey our sympathy and condolences to his widow.

SECTIONAL MEETINGS.

I now turn to the programme of work. The first two subjects are for discussion with the full Board, and I do not propose to make any observations upon them at the present time. Coming to subject III, *i.e.*, the discussion of a "proposal to hold sectional meetings of the Board of Agriculture in alternate years in which a meeting of the full Board is not held," I have very definite views upon the subject. This system of sectional meetings was inaugurated last year, when the mycological and entomological sections held a meeting at Pusa. You have all had the record of the results of that meeting, and I think you will agree that a very great deal of useful work, specially in the direction of co-ordination of effort, was got through. It stands to reason, I suggest, that when we are dealing with a country of the size and the vast interests of India the advantages of full meetings of the Board can only be fully reaped if the various sections, specially the scientific sections of the agricultural service, are enabled at intervals to meet and grapple with the technical problems which concern them and thus be in a position to give to the full Board at its biennial meetings the advantage of their sectional discussions, I venture to hope, therefore, that the answer to the terms of reference under subject III will be of a very emphatic and positive character. The terms of reference proceed to suggest that, if it is decided that there is an advantage to workers in particular branches of agricultural science to meet more frequently, then a scheme should be formulated for holding such sectional or special meetings. Here, I venture to suggest a word of warning. The formulation of hard and fast scheme for such sectional meetings might be, I suggest, a mistake. What is desirable is that more frequent opportunity than at present should be given to any scientific department connected with agriculture to overhaul its work at shorter intervals, and, if a hard and fast scheme were evolved, it might result in deferring, beyond the time when it was urgently needed a convention to consider for example the work connected with agricultural chemistry. If I may offer a suggestion to the committee that will consider this matter, it would be that at each meeting of the full Board it should be determined, in consultation with those scientists who are present, what branch of agricultural science particularly needs co-ordination, and that the sectional meetings of the alternate years should be provisionally determined on the occasion of the meeting of the full Board.

I venture to go a little further and to suggest to the Committee and the Board that on this occasion, whatever other branches of agricultural science may hold a sectional meeting, it is at all events necessary

that two should meet next year, *i. e.*, the agricultural chemists and the agricultural botanists. My reason for venturing thus far with a precise suggestion is that I have noticed, from a perusal of the Agricultural reports of more than one Province, that in the work of the chemists and, in some instances, of the botanists, in some cases a suggestion of overlapping as between provinces, which can hardly conduce to the best possible results. The chemical research which is proceeding in one province should clearly not be undertaken in another province, unless indeed the local conditions render the application of results achieved in one province doubtful in the conditions obtaining in another. In any case, speaking generally, the desirability of securing greater co-ordination in the work of chemical research connected with agriculture will not, I think, be disputed, and the necessity for frequent comparison of results is probably greater in the case of this branch than in that of some of the other branches of agricultural science.

I trust that in making this suggestion I shall not be laying myself open to undue criticism, for, I believe, there is also another reason which makes it desirable that, agricultural chemistry should be more thoroughly co-ordinated than has been the case hitherto. We are all aware, of course, that the war has thrown a lurid light upon the necessity for greater concentration upon scientific research and for greater activity in developing indigenous resources. To such a degree is this the case that it is by no means improbable that it may be found desirable hereafter to co-ordinate chemical research in all departments, in order that the full benefits may be realised from the vast amount of work that is being done in different directions, but which, in the absence of co-ordination, is occasionally done twice over or sometimes is not completed. It has, indeed, been thrown out as a suggestion that there should be a Director-General of Chemistry with Deputy Directors for the various special branches or chemical science. Thus, for example, if there were a Director-General of Chemistry in India, the Deputy Directors working under him would include a Deputy Director for Agriculture and a Deputy Director for Forest Produce and so forth, while the provincial agriculture and forest scientists would work in co-ordination with their brethren in other provinces, under instruction from and in general consultation with their particular Deputy Director. I only mention this possible development, because it seems to me to indicate that sectional meetings of our agricultural chemists should take place at comparatively frequent intervals.

VETERINARY MATTERS.

The terms of reference in regard to veterinary

education are very important, impinging as they do upon the recommendations of the Public Services Commission. You are all aware of the views which I hold with regard to agricultural education and that my hope is that it will not be many years before India is able, owing to the development of higher agricultural instructions to turn out students qualified for the highest grades of the Public Services. You will not, therefore, be surprised to learn that I hope a similar goal will be kept in view by the committee which is to deal with the subject of veterinary education. Veterinary education is largely a provincial matter, and the staffing of the civil veterinary services is mainly a provincial concern, but I feel confident that all provinces are ambitious to develop their veterinary education to the highest possible degree and to make themselves self-contained in the matter of the staffing of their provincial veterinary service.

PUBLICITY.

A very valuable suggestion has been made by Messrs. Wood and Parnell on the subject of summarising and indexing agricultural publications, and the full Board will consider the matter in due course. I do not wish to prejudge their suggestions at all, but I know that you are as conscious as I am that the Indian agricultural department does not get the full credit for all the work it is doing, partly, at all events, because of our inadequate methods of publication. It may be that our critics in the press are unduly critical, for I have seldom seen a commendatory notice of any of our publications, though we have recently endeavoured to popularise them and make them more attractive. There can, however, be no question but that the proposal to co-ordinate our methods of publication is a step in the direction of more effective advertisement of our work, and, when I say advertisement, I do not mean it in the vulgar sense, but in the very important matter of taking the public as we can into our confidence in regard to the improvements we are trying to bring about, and of propagating as widely as possible the results of our researches, so that these may be easily accessible to those interested in the subject.

SUGAR-CANE.

I now come to the sixth subject, namely, the Indian sugar-cane industry, the importance of which it is hardly possible to over-estimate. The terms of reference require a review of the present position of the prospects of the industry in the various provinces, both from the agricultural and manufacturing standpoint. The war, in this case, as in so many others has brought to a head the great disability of dealing with the sugar-cane question on a more thorough and scientific footing, but it has done more than this.

It has served to show that we have an opportunity in the matter of sugar, of bringing about a situation in which India may not only become self-contained in the matter of its production and outturn, but may even become an exporting country. From the agricultural standpoint the subject is of special interest at the present time in Burma, Assam and here in the Bombay Deccan, where the Bombay agricultural department, in conjunction with the Irrigation Department, has achieved results which render it possible to hope not only for a very widespread development of the cultivation of sugar-cane of a high grade but also for the establishment of factories for the production of refined sugar. The new irrigation canals on the Pravara and the Godavery, which I hope shortly to visit, have revolutionised the outlook for agriculture in the districts which the canals irrigate and I am assured that the grade of cane now being grown in some of the irrigated areas in the Deccan is as high as that of any sugar-cane in the world. On the agricultural side I should like to take this perhaps the last opportunity I shall have of saying a few words of appreciation of the invaluable work done by Dr. Barber at Coimbatore. The establishment of the sugar-cane breeding station there was sanctioned in June, 1912, and was inaugurated in October of the same year for a period of five years. The results so far obtained are extremely promising and everyone who has had the opportunity of visiting the station is deeply impressed with the thorough way in which the initial difficulties have been overcome and with the excellent collection of first class cane which has been produced. We believe that so far as the supply of cane for Southern India is concerned, the objects with which the sugar-cane breeding station was established may be regarded as already substantially achieved, while the solution of the problem of the supply for Northern India seems to be almost within sight. The difficulties and risks, however, are extraordinarily great and caution is necessary before a particular cane, as evolved at Coimbatore, can be recommended with confidence for general adoption. Dr. Barber's work in connection with the breeding station has been of enormous value to India and I think I shall not be wide of the mark if I say that the whole country will owe him a debt of gratitude for the great fund of knowledge and experience and the great zeal which he has brought to bear upon the solution of the problems with which he was confronted. When we recently decided to recommend the continuance for a further five years of the term for which the breeding station had been established, we had hopes that possibly we might have the benefit of the continuance of Dr. Barber's valuable services, and he has consented to serve on for a few months

more. We wish he could have stayed for longer, for his loss to the department will be a very great loss; but there is no question but that his successor will find that the work has progressed to a point at which the chief initial difficulties have been overcome and the achievement of results has become a comparatively simple matter. The department will part with Dr. Barber with the greatest possible regret.

On the manufacturing side the problems for solution are almost as intricate as on the agricultural side. When we have solved the problem, on its agricultural side, of the production of the raw material of a quality and of a quantity to the acre which renders competition with other countries possible, we shall still have to make sure that we have organised the adequate chemical control in the sugar factories which we hope will grow up. As stated by Mr. Somers Taylor in his review of Dr. Geerligs' book, published in the last October number of the *Agricultural Journal of India*, "The whole manufacture, from the time the cane is cut until the raw sugar is sent out, depends upon intricate chemical processes, in which a slight variation in method may involve losses which may make the modern factory, with its enormous outlay upon machinery and staff, very little more efficient than the old open pan method, with its small initial outlay and poor outturn. It is to check such losses, and to find out their reason that the presence of a skilled and well-organised chemical staff is an absolute necessity in a modern sugar factory."

In other words, when we have solved the agricultural problem, the rest will still remain for solution the problem of the economic output of refined sugar on modern lines; and that in its turn depends on whether capital will come forward or can be induced to come forward in India for the establishment of up-to-date factories. I understood that this problem is nearer solution here in the Bombay Presidency than elsewhere.

INSTRUCTING THE RYOT.

In regard to the value of phosphate manure in India, including as it does the question relating to deterioration of soil, etc., I do not propose to make any remarks and I will pass on to the 8th subject, namely, "the best means of bringing improved methods of agriculture to the notice of cultivators." I have already on various occasions expressed my views on this subject; but I should like to call to mind the advice which was given by H. E. the Viceroy on the 16th April last at Lahore, since his remarks have a direct bearing upon this question. Lord Chelmsford said: Let me suggest that, if the desired increase of production is to be secured, improvements are necessary in three directions, (1)

in the methods of cultivation, (2) in the selection of better varieties of the staple crops, and (3) in the harvesting and marketing of pure grades. The Agricultural Department is doing its best to introduce all these improvements, and is meeting with a most encouraging degree of co-operation. The superiority of its selected varieties of various crops, especially of wheat and American cotton, has already been proved. I hope that there will be a considerable expansion of research in this direction as soon as more workers are available. . . . Government are also considering the question whether anything can be done to improve the arrangements for the marketing of cotton, so as to secure to the cultivator a full price for superior varieties. These are all matters in which the large land-holders of the Province can render material assistance. You can stimulate improved methods of cultivation on and around your estates by example and precept, you can help your tenants to obtain the best varieties of seed by establishing seed farms in co-operation with the department, and so teach them the value of maintaining pure strains, and you can discourage the practice of adulteration, which has sullied the reputation of India's crops and prevents the cultivator from reaping the full value of his outturn. In all these respects your help will be invaluable; in fact, rapid progress will be impossible without it. Only a comparatively small number of people are able to visit the Government farms, and these who do go are not always satisfied that they could produce the same results themselves. But when they see their neighbour adopting some reform, growing better crops and getting more money for them, then they are readily converted and in their turn become apostles." His Excellency was addressing more particularly the big landowners of the Punjab, but his later remarks are relevant to the general consideration of the question of the best means of bringing improved methods of agriculture to the notice of cultivators. Demonstration farms run by Government are of value, but of far greater value, I suggest, is the demonstration which can be organised and carried out though under departmental supervision in a cultivator's own plot.

ECONOMIC HOLDINGS.

The ninth subject I will only touch upon briefly. It is one of extraordinary difficulty. The question of the uneconomic holding has occupied the attention of agriculturists and economists for a considerable time, and, so far as India is concerned, Mr. Keatinge, the Director of Agriculture in Bombay, has devoted more study to it than perhaps anyone else. You are probably aware that Mr. Keatinge has endeavoured to put his remedial proposals in a form which might take legal effect and the

lines upon which he purposes to proceed are, put very briefly, to legislate so as to enable landowners or proprietary occupants to register a holding as an "economic holding" and, when a holding has been so registered, to provide that it should then become impartible, like certain other kinds of property in Hindu law. In a paper from Professor Stanley Jevons a similar line of argument is used, and he advocates the device of "a system of officially recognised trustees of estates imperfectly parted." Whether his proposals are within the range of practical politics, however, will be for you to discuss. Quite recently, the matter has also been the subject of investigation by H. H. the Gaekwar's Government and the conclusions which were come to tentatively follow lines somewhat analogous to those suggested by Mr. Keatinge. Last, but not least, Dr. Harrold Mann, as you all know, recently contributed a most valuable paper on the subject of the economics of the Deccan village. The whole subject is one of profound interest for almost every province of India, and I think we may look forward to a very interesting and informing discussion. The conclusions come to by a Board of Agriculture must necessarily be tinged with an agricultural bias, but I am quite sure from the thorough way in which Mr. Keatinge has gone into the subject that the economic, the legal and traditional aspects of the question, will not be overlooked. An interesting article was published in the *Agricultural Journal* for April, 1913, entitled "The consolidation of Scattered Holdings," in which was quoted an extract from the presidential address delivered before the Swadeshi Mela by Raja Pyari Mohan Mukarjee, who evidently advocated action by Government in the control of the subdivision of estates; but the difficulty in the way of the remedial action is undoubtedly far greater as the evil itself is also of greater dimensions, in India than elsewhere.

The tenth subject is closely connected with the fifth, to which I have already referred—and I would only suggest that in your deliberations you should bear in mind the need for co-ordination of method between Imperial and Provincial, and for keeping an eye on the man in the street as well as the technical and professional expert. We are in duty bound to keep the general public informed of our work, and I suggest that it would be well to consult unofficial publishing agencies from time to time on the subject of our methods of publication. I know Mr. MacKenna is fully alive to the need of this.

ADULTERATION.

Subject XI "Experimental error" is a very technical one, and I pass on to XII, "what action can profitably be taken by Government to discourage

the adulteration and mixing of agricultural produce." This is no new problem and it is one to which I have had occasion to refer before now, as for example in my speech in the Council on the 10th March, 1917. Like so many other things, the evil has been brought even more prominently to notice as result of the war. As has been stated by the Government of India in a reference which has been made to Chambers of Commerce, it seems reasonable to suppose that the present war will be followed by a period of keen competition among industrial nations for materials of all descriptions and for products which India should be in a specially favourable position to supply. It is, however, a question whether India will be able to capture and retain these extended markets if steps are not taken to effect an improvement in the reputation which some of her products have, through this malpractice of adulteration, earned in the past. It is to be feared that though in some respects an improvement has taken place in this matter, cotton is still watered, jute is still adulterated, ground-nuts, hide, indigo and oils are also tampered with. Action of a tentative character, aimed at prevention, has, as you all know, been taken from time to time. For example, a very great improvement has taken place since 1906 in regard to the adulteration of wheat, and it is satisfactory to note that the Royal Commission on wheat supplies is now purchasing all grain, including barely, gram and maize, on a pure basis and this, it is hoped, will be continued. In regard to cotton, the obstacles to Government intervention to prevent fraudulent damping and mixing were the difficulty of making any legislation effective without an inquisitorial system of inspection, which the results might not justify—the undesirability of avoiding a repetition of evils to which the Bombay cotton law gave rise and the belief that the remedy largely lies in the hands of the dealers themselves. In regard to the last consideration it is satisfactory to note that in Madras it has been possible to bring cotton dealers together in a combination to prevent the fraudulent admixture of pulichai cotton with better grades. Similar arguments against intervention by Government were held to apply to the fraudulent watering of jute. Again in regard to hemp, an enquiry instituted few years ago elicited the opinion that the remedy for the defects in the method of preparation of hemp exported from India lay in the hands of the buyers themselves. Although Government are still inclined to adhere to the view that the evils of Government intervention outweigh the advantages, suggestions have again been invited on the subject from Chambers of Commerce, and Government have expressed their willingness to co-operate if further discussion should show that

any action on their part is feasible and desirable. It has been suggested, however, that if the leading exporting firms of the various commodities would arrange with their leading buyers to insist on freedom from adulteration, an improvement would probably result more readily than by any form of intervention on the part of Government. All these pros and cons will no doubt be taken into your serious consideration, and Government will welcome cordially any suggestion which the full Board are able to submit to them calculated to lead to the discouragement of the adulterations which have brought Indian produce into such questionable repute.

FOOD CROPS.

Subject XIII is one of peculiar interest at the present time. As you are aware, circumstances have arisen which have made it desirable during the past two years to encourage, as far as possible, an increase in the outturn of food crops and various expedients have been suggested for encouraging widespread sowing of wheat and other staple food crops. It is not necessary for me to refer here to the various schemes submitted, in some cases put in force, for encouraging the bringing of waste land under cultivation and of extending on easy terms the temporary cultivation of land, for that is a question of administration, pure and simple. What the Board are concerned with is the purely agricultural aspect of the question, and this seems to me to be largely one of the efficacy of our methods of organisation. Do these methods enable us in a sudden emergency to assist in concerting a sudden and rapid expansion of cultivation on broad lines? If not, is it possible to devise methods which will be an improvement on those at present in use? You will see from the terms of reference that allusion is made to the improvement of yield by the introduction of improved varieties, by the increased use of artificial fertilisers, and by means of improved cultural methods; and the question for consideration really amounts to this:—Are we, with the staff of the department, both Imperial and Provincial, organised as it is at present, in a position directly and at short notice, to facilitate the diversion of the energies of the cultivators on particular occasions into particular channels? We are all aware that we are lamentably understaffed as compared with the needs of this great country, but that is, for the moment, an auxiliary point. The main issue is whether, with an improvement in organisation, it is possible to devise methods better calculated to achieve the result suggested in the terms of reference.

In regard to subject XIV, the matter as stated in the terms of reference was discussed on the third day of the Board of Agriculture meeting held in 1907, and a good deal of information was there given, leading up to the conclusion that the time was not then ripe for the introduction of legislation on commercial fertilisers; but the Board recognised the desirability of maintaining a special watch over the developments which might occur in their use. It was stated by Dr. Leather on that occasion that there was already a real awakening in recent years as to the

value of oil-cakes among the cultivators of India. It will be interesting to see whether that awakening developed and has resulted in such a change as to make it desirable to reconsider the position then arrived at.

CONCLUSION.

I have already detained you too long I fear, and I will not refer specially to subject XV. But I must just briefly remark, in regard to subject XVI, that we seem to have come now to a stage at which it is possible to consider the laying down of lines of investigation in regard to the water requirements of crops for different tracts in India. Dr. Leather, on the commercial side, and Mr. Howard, on the agricultural, have both gone into the subject, while the attention of the agricultural workers in provinces have also been directed to it in recent years. The problem is to systematise the future prosecution of enquiries, especially in a province where irrigation is extensive, such as the Punjab, and even for areas less extensive, such as the Bombay Deccan. I know that here too the problem of water-logging is a serious one and that the economy of water will operate beneficially in two directions. I understand that the Sub-Committee which is to deal with this subject will be presided over by Mr. Ward, the Inspector-General of Irrigation, and will include also Mr. Gebbie, Chief Engineer, Bombay, who has had long experience of irrigation in Sind. I hope that the result of the Board's deliberations will be to evolve a systematic line of experimental advance, which may lead us to definite conclusions and a definite policy.

The last subject I propose to refer to in the briefest possible manner, since I fear that you already feel that I am an Educational Minister gone wrong. We discussed the lines of policy for agricultural education at great length last June in Simla, and the problem before the Board is to frame a model syllabus for agricultural middle schools. I would only add on this, my pet subject, that just as it is now realised that a development of education throughout the country must form the basis of any lasting political advance, so widespread agricultural education is a necessity if all the work which the agricultural departments in India are doing is to reap the fruits which the amount of the labour expended entitles us to hope it will.

Before I sit down I know that everyone will wish me, on behalf of the Board of Agriculture, to extend to the Bombay Agricultural Department, from H. E. the Governor, the Hon'ble Mr. Carmichael, Mr. Keatinge and Dr. Harold Mann downwards, our cordial acknowledgements for their kind hospitality. The arrangements made for accommodating such a large influx of visitors at this time of the year, and in our present war conditions, must have given a very great deal of trouble to our kind hosts, and we all feel that a great debt of gratitude is due to them for facilitating our visit and for enabling such of us as are not familiar with this part of India to obtain an insight into agricultural conditions in the Deccan. In conclusion, I beg to apologise for the length of time during which I have detained you, and to ask Mr. Mackenna to indicate to us what is the immediate programme of work.

The Conference then proceeded to the agenda.

CO-OPERATION.

Co-operative Societies in Bengal. Report for 1916-17.

The following extract is taken from the Resolution on the Report on the Working of Co-operative Societies in Bengal for the year ending the 30th June, 1917, published in last week's *Calcutta Gazette* :—

The year ending the 30th June, 1917, was, on the whole, a year of agricultural prosperity in Bengal, and it has been marked by acceleration in the development of the co-operative movement. The year's increase was, in the number of societies 843, in the number of members 21,615, and in the working capital twenty-seven lakhs, compared with 251 societies, 14,717 members and fifteen lakhs, the increase of the previous year. The reserve funds have increased from 8½ lakhs to 10½ lakhs.

The outlook is promising, but the Registrar has not omitted to draw attention to weak points; and the details of his report demonstrate clearly the truth of his contention that further development on a sound basis requires an increase in the strength of organizers, both official and non-official. The careful selection and instruction of office-bearers at the time of the formation of new societies the relentless pursuit of those office-bearers who have been found guilty of dishonesty, the continuous supervision of societies which show tendencies to slackness, and the thorough audit of every society constitute a task which throws an ever-increasing burden on those on whom the movement relies for its success. Co-operation in Bengal is no longer in its infancy; and while the Governor in Council realises that for some time to come the Registrar will necessarily require a substantial staff of trained subordinates throughout the Presidency, it has become evident that the staff paid by Government cannot be indefinitely increased in proportion to the increase in the number of societies, and that the movement can afford and will be obliged to bear a substantial share of the financial burden. The Provincial Co-operative Conference which met in February 1917, accepted the principle that every well-established society should contribute to the cost of audit, and during the year under review a scheme was worked out which will provide for an immediate addition to the staff of fourteen auditors who will be paid for by societies. This will make provision for the regular audit of all societies, which is the first necessity and is required by law. The extent to

which the number of Government Inspectors can be increased is now under the consideration of Government, but it has become apparent that as the movement expands it will have to contribute more largely than in the past to the cost of general supervision as well as of audit.

In reviewing the report of the year 1915-16 the Governor in Council remarked on the substantial assistance which was given by Co-operative Societies during the period of distress which prevailed in Tippera district in 1915, and he remarked that the results of the year 1916-17 would indicate whether the public had been well advised in placing confidence in the societies. He has, therefore, examined with interest the statistics which concern the societies in this district: the amount repaid by members of Agricultural Societies during the year 1916-17 was Rs. 1,83,845 against Rs. 69,579 repaid during 1915-16, but the overdue loans have increased from Rs. 1,02,788 at the end of 1915-16 to Rs. 1,15,371 at the end of 1916-17. The increase in the total of repayments is substantial, and the amount repaid represents nearly half of the total amount outstanding against members at the end of 1915-16. On the other hand, the amount of overdue loans is excessive, and in view of the fact that agricultural conditions were generally favourable in Tippera district in 1916-17, the Governor in Council considers it to be a disappointing result that the amount of overdue loans has not been substantially reduced.

For financial reasons no progress was made during the year with the scheme for a Provincial Bank, but, as the Registrar has observed, the business of financing Central Banks with deposits made by residents of Calcutta has grown to such an extent as to necessitate proper machinery for its control. The Governor in Council has under consideration a scheme for a Provincial Federation of Central Banks which is intended to provide this machinery without making any attempt to attract large quantities of new capital which are more urgently needed for other purposes.

The number of Central Banks has increased from 39 to 47, the present policy of the Department is not to encourage the formation of new rural societies except in areas in which there is a Central Bank to which they can be affiliated, and thereby to minimise the danger of making a bad start on account of inadequate control. Consequently there has been very little progress in the seven districts which were mentioned in last year's report as being backward in co-operation, because none of them yet has a Central Bank. The working capital of Central Bank has increased from 46½ to nearly 59

lakhs; their reserve funds from Rs. 1,11,901 to Rs. 1,46,008; and the paid-up share capital from 6½ to 8½ lakhs. The appointment of paid Secretaries in four more Central Banks is a step in the right direction towards improving the control of these banks over their affiliated societies. The Governor in Council agrees with the Registrar's opinion that it is essential that societies should realise their own responsibilities in respect of punctual collection of dues and should not expect this work to be done for them by Government Inspectors.

The Registrar gives a somewhat depressing account of the work of supervisory unions, the number of which has increased from twelve to thirteen. Rural Societies show no inclination to form unions with a view to guaranteeing one another's loans, and there is dearth of suitable men outside the headquarters of districts and sub-divisions to take up the work of managing unions.

The number of agricultural societies has risen from 2,067 to 2,857; the membership from 94,074 to 110,961; and the working capital from fifty seven to sixtyseven lakhs. Loans issued to members rose from 17 to 26½ lakhs, and loans repaid by members from 14 to 18½ lakhs, but there are seventeen lakhs of overdue loans which represent 30·8 per cent of the loans outstanding, the percentage of overdue loans in the previous year having been 26·6. The Central Banks should give their unremitting attention to the enforcement of punctuality in repayment, and to the substitution of honest men for the office-bearers who have brought discredit to the movement in certain areas. Among the societies of special types the Khelar Irrigation Society in Midnapore district has had a successful year and the Governor in Council hopes to see this beneficial form of co-operation imitated elsewhere.

The Departments of Agriculture and Co-operation have held several joint conferences at which practical schemes for spreading agricultural improvements were discussed. Their joint efforts have been largely devoted to the extension of potato cultivation. The collection and distribution of selected potato seed, and the realisation of its value from cultivators scattered over many districts is by no means a simple problem: the attempt to organize this business has proved a heavy burden to the officers of the departments. The extensive use of manures in the future depends largely on the joint efforts of the two Departments, because the use of expensive manure involves purchase on credit.

EDUCATION.

Education in England.

PARALLEL MOVEMENTS IN GERMAN AND ENGLISH EDUCATION.

The following informing contribution from Dr. M. E. Sadler appears in the November number of *Indian Education*:—

Since the war began, only a limited circle of privileged people have had access to current books and journals published in Germany. Not knowing the grounds for this restriction upon the circulation of German publications in this country in war-time, I do not enter here upon any criticism of the policy which has cut off almost every private student in England from first-hand knowledge of what is now being written in Germany on social, philosophical and economic questions. In order to prevent trading with the enemy, it was obviously necessary to interfere with the import through neutral countries, and with the distribution in the United Kingdom, of the products of German industry. But it is curious that steps were not taken to secure, through official channels, a full supply of German books and scientific periodicals and to deposit them in the great Universities and Public Libraries of the country for consultation and use by qualified persons. The extracts from current German literature which reach the public in war-time through the newspapers and weekly reviews are quite inadequate for scientific purposes and are almost always selected hurriedly and with regard to what will take the popular fancy at the moment. In the best English books on the war and in some magazine articles, well-considered summaries of certain departments of current German literature may be found. But the materials upon which such summaries can be based are in very few hands and the private student has (except as regards discussions on the origin of the war) been almost as isolated from German thought as if he had been in prison. The student of education has been in particularly bad case. The daily and weekly press has ignored current German literature on the aims and methods of education, except that now and again some quite inadequate reference has been made to the subject. This is particularly unfortunate because, since the war began, the discussion in Germany about the bearing of educational influences upon national life has been even more eager and general than in England. Our newspapers, with the information which could have been put at their disposal, might have easily

kept their readers informed as to the significant trend of German thought about education under the stress of war. That they have failed to do so implies a belief that English readers are not disposed to take any interest in these subjects—a belief which is probably a fallacy and, if well-grounded, ought to lead to immediate efforts to show the bearing of educational thought and practice upon modern politics.

It so happens that in the field of education the present movement of German thought is of high importance to those who are interested (and who is not?) in the deeper issues of the war. Liberal ideas about the organization of national education are sweeping over Germany. It is evident that many of the officials in the various Government Education Departments in Germany are sympathetic with some of the aims of the new movement and disposed to make great concessions to it. But one phalanx resists the disorganized crowd of reformers. That phalanx is Prussia. The Prussian Junker stands like granite against educational plans which, if realised, would ultimately undermine his social privilege and economic advantage. And the Prussian Junker knows how to influence the mind of the leading bureaucrats in Berlin. The Prussian Education Office (though it includes many men of liberal tendencies) has been cowed by the fear of Junker hatred. Therefore, though there is a striking movement throughout Germany in favour of making the privileges of national education more effectively open to the masses of the people, the Education Office in Berlin (in spite of certain waverings and conciliatory, though ambiguous, speeches) has remained immovable. In the South of Germany the liberal movement is stronger, but over against it the Catholic Party stands suspicious and reluctant to move. This is due partly to the conservatism of the institution with which it is connected partly to the fact that the Roman Catholic point of view is discordant with some of the chief pre-suppositions of modern liberal thought on education and definitely opposed to the most extreme social views which usually accompany advanced thought on educational questions. The result is that, though some Roman Catholics (especially Professor Forster of Munich) are prepared for the frank discussion of educational aims and for great reforms in present practice, the more silent mass of the Roman Catholic leaders stand aloof from the discussion but intervene at the last moment when decisive official action is threatened.

What has happened in German politics about the war is thus exactly reflected in what has taken place in German discussion about education.

The liberal movement has grown immensely in power since the campaign took an unfavourable turn to German interests. Like the Majority Socialists, the more extreme educational reformers have been brought for the first time into something like administrative co-operation with the Government. They have given up some of their own cherished theories in hope of getting something done, but at the same time have modified very deeply the conventional views of the officials and of the moderate politicians. Just as the wave of liberal feeling about the methods and responsibilities of Government rose to a crest in Germany three months ago, so did the feeling about education and the desire to break down the barriers which have kept higher education in Germany, to a degree not always realised, the appanage of the middle and the higher class. What Eizberger, the Roman Catholic Free-lance, has been in the Reichstag, Professor F. W. Forster has been in the sphere of education. But in education as in politics, the closely welded mass of the Prussian tradition has broken the wave of reform, and the majority of the Catholic party, in education as in politics, has disowned its free-lances, after playing with their ideas until the remorseless opposition of the Prussian Conservatives was disclosed.

In Germany as in England, it is realised that the methods and aims of elementary education will have to be reconsidered if the people are to be given real responsibility in the higher affairs of State. The German elementary school is admirably organized for a particular purpose. In part that purpose is becoming obsolete. It has been kept as a department of State separate from secondary and higher education. Its teachers have been trained not at the Universities but in special Seminaries. It is rigidly inspected by a body of men who inherit a belief that the elementary school must make diligent workmen, obedient citizens, industrious mothers of families. It imparts with authority a religious doctrine from which multitudes of the working people are openly estranged. It inculcates, both by direct teaching and still more by suggestion, a political view which is unhesitatingly favourable to the existing regime, and in glaring contrast to the professed convictions of the largest of all the political parties in the Empire. However clever an urban labourer's boy or girl may be, the odds are heavily against their climbing over in time the obstacles deliberately set up in order to make egress from the elementary school system difficult. However promising may be the

scientific or linguistic gift of a youth whose parents have assigned him early to the elementary school teaching profession, the chances are heavily against his ever getting to the University. There are exceptions to all this of course. In some respects the boy of brilliant promise in a rural district has more chance of being picked out and given a higher education than a similar boy in the working-class district of a German industrial city. The reason for this is that he is more conspicuous and may find a friend who, by special teaching or advice, will help him in time to get upon the lower rungs of the ladder which alone leads up to professional positions and to posts of greater responsibility. But, in the main, the German secondary and higher school system is wired round with restrictions designed for a political purpose. It is these barriers that are now threatened. The more advanced parties in Germany demand a complete reorganization of the whole educational system. They insist that the basis of the whole should be the common elementary school, the same for everybody, the unique avenue to higher education. This change, its advocates believe, would abolish what in England we call snobbery and would secure a union of social sympathies throughout the nation. They would make the education given in these schools (*Einheitsschulen*, as they call them) modern and liberal, a common basis for all higher and more advanced education. Every boy or girl would pass through such a school up to fourteen years of age (with some differentiation of studies in the later years of the course and with separation in parallel divisions, of the slower learners from the more precocious) and the secondary schools would be built as a second story of the edifice upon this one foundation. The preparatory schools at present attached to the secondary schools would be abolished. Private schools would not be allowed. The religious education would be undenominational. Every faith would have equal right. The more extreme party would have the school secular. The present curriculum of the secondary schools would be revolutionised in order that a pupil could pass on quite naturally from the highest class in the elementary to what would then be the lowest class in the secondary school.

There is no likelihood of this scheme being realised. It might possibly be introduced as a result of a sweeping revolution in Germany; but it would quickly be modified in the light of inevitable experience. The German theorists who advocate the *Einheitsschule* ignore the inseparable connection between education and social traditions and under-rate the importance of home surroundings and

family influences in the education of young people. They have isolated the school from its social context. They exaggerate the power of the school as compared with the power of social tradition. They ignore the tenacity of social differences. They have over-simplified their problem. By thinking too exclusively of the work of schools they have narrowed their view of education. But there is force in their objection to the present system. What is likely to happen, as one of the political changes which will follow the war, is the opening out of an easy passage from the elementary to the secondary school. The Mittelschule, long the Cinderella of the Prussian Education Office, will at last come into its own. In other words, the higher parts of the elementary school system will be differentiated and an education which is intermediate between the most advanced secondary and the elementary schools will be encouraged and developed. Furthermore, those intending to be teachers in elementary schools will be given more access to Universities. The present isolation of the elementary school teachers' training colleges will be modified.

In other words, the prevailing current in German educational thought is moving in the English direction. What we have done in this country, Germany, now sees to be necessary under modern conditions. The educational theories of the Junker and of the older type of Prussian bureaucracy are nearing their last ditch. It is probable that, twenty years hence, the stiffness of the present system will be greatly relaxed, and the claims of the masses of the people will be more generously recognised. The strength of this new movement is so great that it is not hazardous to draw inferences from it as to the political and social outlook of the German people after the war.

One necessary change in German education will be the increase in the number of women teachers, especially in the public elementary schools. The experience of the war and the loss of so large a number of young men will force Germany to abandon the old bureaucratic prejudices against giving a responsible place to women in national education. The change, which began in America and is now so conspicuous in England, will spread to Germany. Nothing will affect so deeply the tradition of internal discipline in the German schools. It is at present, for good and evil, a masculine discipline, apt to be rough and inconsiderate and to take on some of the bad features of militarism.

Twenty years ago, a little book called *Padagogische Goldkorner* was popular among German teachers and was put into the hands of those who were entering the profession. It is a collection of educational aphorisms for the guidance of teachers.

So long ago as 1893 it had run into its sixth edition. The fifth aphorism in the book dealt with the function of women as teachers. It was a quotation from a Dr. Stern. He wrote: 'In the intellectual side of education, women must inevitably take a very limited and secondary part. The reason for this is that a woman's nature does not possess the first condition required by a capable teacher, namely the power of logical deduction and of developing a subject according to a clearly conceived, definite plan. Women have not the capacity to make a synthesis out of separate facts or to find a general law from a number of individual instances. Nor can they put their pupils in the way of accomplishing this act of thought. The most beautiful relation which a woman teacher can have in a school is that of being the confidante of the pupils and an interceder between them and the man teacher.' The solemn author of the little book immediately proceeds to the sixth aphorism, which he takes from Schefer. It runs as follows:—'Beautiful men ought to be chosen as teachers, just as, among the Persians, the king had to be the most beautiful man in the nation; Personal attractions, by their mere presence, convey lessons without words.' It never occurred to the compiler of *Padagogische Goldkorner* to put two and two together.

Before 1914, Germany had already drifted far from her old moorings of thought in respect of the place of women in national education. But the growing power of militarism during the two decades 1894-1914 had held back what would otherwise have been an inevitable softening of the discipline in the German elementary school. After the war, the influence of women in German education will spread with startling rapidity. The new Germany will find that a new outlook in education is congenial to its needs. Without any sudden breach between the old tradition and the new methods, there will probably be changes in German education which will bring the system more closely into line with that of England and the United States. The new Russia will find itself as much in sympathy with a German education thus tempered and softened as it is now repelled by its imported forms of German educational ideas. In order to hold its place in world thought, German education after the war will have to accept and to put in practice liberal ideas. And as coming events always cast their shadows before, it is significant that before the war there were already decisive signs of this impending change.

These signs may be briefly mentioned here. There was unrest about elementary education. The isolation of the training colleges for elementary school teachers was challenged. Demands for the establishment of training departments at the Universities had

become persistent and powerful. The claims of the *Mittelschulen*—the intermediate schools with comparatively short courses of study—were pressed on the authorities. The privileged position of the so-called 'higher schools' (the *Gymnasien*, the *Real-Gymnasien*, the *Ober-realschulen* and the *Realschulen*) was evidently not so secure as it had been twenty years before. The higher education of girls had made rapid advance. In other words, democracy and the claims of women were pressing for fuller educational opportunities. And, within the higher schools themselves, there had been a change in the focus of intellectual interest. The old primacy of the classical studies had been impaired. Modern interests had affected not only the curriculum, but also the point of view of the school-master, and the attitude of mind of parents and boys.

To these currents in German educational opinion since the beginning of the war, there is a curious counterpart in England. Here also the great floating docks in education—so huge that to the inexperienced observer they seemed fixed in unalterable positions—have gently moved under the impulse of currents of opinion, noiseless but immensely strong. Before the war, the chief thoughts of educational reformers in England were pre-occupied with the problems of adolescence. The strengthening of the secondary schools for boys and girls, the provision of continuation schools for young people already at work, were the questions upon which the most serious administrative thinking was focussed. But, after two years of war, the field of national education was seen in a new perspective. The elementary school problem had become the most urgent. Nursery schools, medical care for elementary school children, better payment and prospects for the elementary school teachers, reforms in elementary school curriculum and methods of teaching, had taken on a new significance. Not only in bulk but in national importance, the elementary school problem in all its many-sidedness, loomed larger than in the years before the war. New light was thrown upon the service which the nation must look for from the secondary schools. The latter must be no privileged *parterre*, the appanage of the comfortable classes, accessible to just a few of the less fortunately born. They must justify themselves as part of a great organism of educational institutions, as members of a vast body, as channels through which a new social ideal could travel in its course throughout the whole of national life. Democracy had changed the educational perspective. Furthermore, the service of women in education had become more prominent, and the economic status of women teachers (and the future position of

married women as members of the teaching staffs of elementary and secondary schools) was now one of the chief problems for discussion and settlement. The continuation school question was viewed less as a topic by itself than as a fringe-question of the public elementary schools. The relation of the Universities to the mass of the people, (and especially the conditions upon which the Universities might be entered by students who had not been to secondary schools) became a topic of pressing concern. And, therefore, attention was directed to the intellectual and other needs of the highest classes in the elementary schools, to the value of advanced departments in many of those schools, to the establishment of central schools in town and country—of central schools, that is, which, though not 'secondary' in the technical sense of the word, form nevertheless a loop line along which some pupils may travel from the elementary school to the University or higher technical schools without entering the 'secondary school' proper at all.

This change in the centre of gravity in English educational thought during the first years of the war corresponds very closely to what had been taking place in Germany during the same period—an unintentional correspondence, and, because quite unconscious, the more significant. But just as in Germany there was (after a short welcome) a reaction against these new points of view—a reaction partly produced by the extravagance of some of their advocates but more deeply due to instinctive political opposition—so in England after a brief season of apparent agreement, signs of counter-working began to show themselves. Except for an instalment of better remuneration for the elementary school teachers, nothing serious was done to improve the elementary schools. Nursery schools, it is true, was encouraged, but there were no signs of determination on the part of the Board of Education to reorganize and improve the elementary school curriculum, or to develop the higher classes, or to encourage central schools, or to enlarge opportunities for the training of elementary school teachers, or to review the presuppositions of the elementary school tradition in the light of Dr. Montessori's experience. Fundamentally the reason for this apathy is, I believe, an indisposition to make elementary school education all that a free, self-governing nation really requires. This indisposition is partly traditional. In hardly any case is it the result of conscious antagonism to popular needs. But the antagonism is none the less operative for being instinctive and concealed. The necessary changes would cost a great deal. Therefore it is easy to say that in war time the nation cannot afford to make them. But the same excuse was urged

before the war when the nation was prodigiously rich. And in no other field of urgent national need are difficulties of finance allowed at this crisis to prevent costly alterations and extensions. That financial (or Treasury) resistance is strong is obvious. What is equally obvious is that no minister has broken that resistance down, as Mr. Lloyd George broke down similar resistance to the large-scale provision of munitions of war. Half consciously, behind the Treasury resistance, lurks antagonism to the social ideal which is vaguely expressed in demands for better elementary education.

Another factor which has helped in preventing the Government from dealing energetically with elementary education is the denominational difficulty. Let it always be remembered that among the clergy, priests and ministers, are to be found many of the most sincere and experienced friends of elementary education. But if you begin to make drastic changes in the schools, you cannot avoid disturbing a web of administrative concordats which has been woven about our elementary school system, with the purpose of allowing (so far as this is possible) concurrent opportunities for schools which stand for some defined religious belief and its observances and the schools which reflect the rays of the French Revolutionary movement and (whether undenominational or secular) are fundamentally opposed to ecclesiastical management or influence in any form. Now, a great synthesis between these two opposing ideals is possible. But, in order to reach it, each side must give up something, in a large rearrangement of functions and powers. Possibly the time is not ripe for such a synthesis. Possibly the misunderstandings and suspicions of earnest enthusiasts on either side have prevented it from being realised while yet there was time. No one can say with confidence which of these views is the nearer to the truth. But no present statesman dare grasp the nettle. The existing Government passed the word round that in their Education Bill they would not raise the denominational difficulty in any shape. An awkward silence ensued, broken here and there by the groans of individuals who felt uneasy at the decision. But the high officers of the Churches agreed to a truce. They would not raise the religious difficulty if the Government preserved the existing balance of interests in the government of elementary schools. The result is that the present Government has avoided any searching reform in elementary education, a decision which has bought immunity from religious controversy (for the moment at all events) but is also in harmony with Treasury desire for the avoidance of heavy expenditure and with the instinctive wish of the present economic regime to refrain from strengthening the

forces of the new democracy through a deepening of the intellectual power of the elementary schools. Thus, Church, Finance and the Economic Regime are all in tacit agreement, not in their several social aims but in approving continued neglect of the fundamental reform of the elementary school system. And, at the critical moment, the decision of the Church (like the decision of the Roman Catholic Centre in Germany) gave the signal to damp down what was really most vital in the educational movement which sprang into flame last year in both countries. Let me not be supposed to blame the Church for its decision. In the circumstances it may have been necessary and wise. I know some of the conditions, and think that, *at the moment*, the leaders of the Church would have done more harm to educational unity in the nation by insisting on raising the denominational question than they could have done good to education itself by refusing to accept the Government's offer of a truce. The Church itself is divided in its educational ideals. In the Church of England, for example, the Archbishops represent no solid block of opinion. They are deservedly influential and honoured but they are like index-fingers upon a dial, quiveringly reporting the inner pressure of conflicting opinions behind them. By our historical ill-fortune, some of the most ardent advocates of what they believe to be educational progress are blind to the value of the spiritual element in the religious tradition of education. And, if the Church had demanded a thoroughgoing settlement of the problems of elementary education (and, with it, recognition of the right to claim distinctive religious teaching in every tax-supported school), many zealous educationists on the other side would have exclaimed with horror at the ambitions of the clergy and at their "unappeasable appetite for power" and at their want of patriotism in refusing to welcome harmony and united action in education during the war.

The outcome of these complicated forces is that the Government has not raised the fundamental issue in English education—the one issue which really matters and in which the nation would quickly shew its interest—namely 'For what kind of economic and social regime do we intend deliberately to train the younger generation? What kind of life—as citizens, as wage-earners, as individual consciences—do we mean to make it possible for them to live, and to train them to live? What is to be the social and spiritual ideal of our English education from top to bottom?' And it is precisely this issue that the German Government has refused to face—and for pretty much the same reasons.

But the nature of the real force which has prevented the German Government from dealing with the problem is different from the nature of the real force which has prevented our own. In Germany, (though there are many Education Departments in the German Empire, dominant motive is now virtually the same in all the chief of them) the central and controlling motive is a determination to keep intact military control over civil affairs and policy. In England, the central and controlling

motive (operating unconsciously for the most part, and through personalities which have great claim to our respect) is a desire to preserve the present economic regime which, with all its admirable sides, has one fatal blot, one piece of rottenness at the core, namely, the assumption that in the business dealings between man and man competition as expressed in considerations of money profit must be given the chief word, because 'business is business.'

Let us not inconsiderately blame the bankers, investors and officials who feel that the first duty of our statesmen is to maintain and enhance what they call our 'industrial and commercial efficiency.' Obviously, we must not enter upon the road to ruin. Obviously, idleness, slackness and ca'canny are bad. But the point really at issue is whether there is not a new economic regime towards which we should with deliberate purpose work our way: a different ideal for which we should discipline ourselves and train the young: a way of economic and civic life which puts its 'profit'—not out of account but out of its central, dominating position: which conceives 'profit' in a larger, more human, and less self-regarding sense: which, in short, aims at correcting the one-sided pre-suppositions of the industrial revolution (and of the economic regime which has resulted from that revolution) by an infusion of ideals and restrictions more akin to those of the middle ages—but again without accepting the one-sided presuppositions of the mediæval system. Syndicalism plus individual enterprise: guilds plus individual liberty: the Spiritual Power without ecclesiastical tyranny; State action plus corporate life; the recognition of Nationality and at the same time the recognition of Super-National authority. This is the synthesis towards which the world is moving. It is still unformulated, still awaiting the slow fashioning of experience. But it is a real power in the world. Every year adds to its force. And education awaits the leadership which will turn it, consciously, towards the new ideal. The lack of any reference to this fundamental issue makes Education Bills dull, educational propaganda sectional and uninspired, and the English nation cold towards new educational schemes.

There has been published recently a book which every student of English education should read. It is called 'The Town Labourer 1760-1832'; has been written by J.L. and Barbara Hammond, and is published by Messrs. Longmans. It is brilliant in its assembling of historical facts: masterly in its spiritual interpretation of them. Its authors see the truth and have had the courage to tell it out forth right—the true Truth which is a resultant of many different truths. To read the book is to learn how to diagnose the central disease of modern England—a disease which will not be fatal if after the war our young men and women apply to civil problems the courage and determination with which they have set themselves to the task of military organization and endeavour. Once laid bare, the mischief which spoils the present economic system will be less dangerous because there will be a determined effort to put a stop to it. And putting a stop to it will not involve, necessarily involve, violent revolution, but quite inevitably a change of spirit; a new attitude of mind: a new scale of values; a readiness to weave old and new things into a fresh pattern; respect for what is good in the past and ardent faith in the possibilities of new ventures of the spirit;

patience and boldness; and, not least, an eager use of education as a means of training the young generation for a new way of life.

But the lists are not yet cleared for this great combat between the old economic regime and the new. Here and there, however, one sees signs of its coming. On September 3, one of the most representative of Lancashire men, Mr. John W. McConnell, the Vice-Chairman of the Fine Cotton Spinners and Doublers' Association and Chairman of the new Research Association for the Cotton Industry, wrote a letter to the *Manchester Guardian*, deprecating parts of Mr. Fisher's Education Bill and especially some of his aspirations for a finer intellectual outlook in our elementary and continuation schools. Mr. McConnell closed his letter with these significant words: "So long as we confine our discussion to the question what educational system will best promote our commercial and industrial efficiency, we are on solid ground. But, in regard to citizenship, to training for higher enjoyment of life, and so on, it seems to men of ordinary abilities that no such certainty of result can be assured as will justify compulsion." In short, Mr. McConnell conceives of national education as a buttress of the existing economic regime, and as a means of extending the latter's conquests and of assuring its continuance. He sniffs at a conception of education which aims at preparing boys and girls, men and women, for a way of life that will attain something far higher and more satisfying to the body, mind and conscience. He is one of those who, unconsciously for the most part, are ready to spend money on education if it pays the existing economic regime. His predecessors were hostile to popular education because they thought it would interfere with the interests of the regime. The supporters of the latter have shifted their ground. Perhaps they are too late. The economic regime, under which we still live, had the chance for forty years of developing scientific research and industrial training. It missed the opportunity. Now, when the clock is striking for the change, its supporters wake up and propose to take over and use the system of national education. It is too late?

Perhaps not. At any rate there are powerful official influences at work in this direction. Great attention is being paid to the secondary schools as recruiting grounds for the civil service and for industry. Industrial research is boomed. State money is pressed upon the chief industries for the establishment of trade laboratories under trade control. Hurried steps are being taken to establish what is virtually a State examination for secondary schools. Representation on the Advisory Council which will supervise this examination has been long refused, and now but reluctantly conceded, to the spokesmen of elementary school experience. And the Government propose under the influence of Lord Haldane, to set up new Provincial Authorities, independent of the County and County Borough Councils, for the special guardianship of secondary school and University questions. These new authorities, if established, will side track and virtually replace (in matters of secondary and higher education) the existing Local Authorities, through which the new movement in social questions is likely to show itself first—in forms however inconvenient and in words however ill-judged.

STATISTICS.

Banks in India.

Mr. Findlay Shirras, Director of Statistics, has published an interesting volume dealing with Statistical Tables relating to Banks in India, with a Map, Introductory Memorandum and Banking Directory. We take the following extracts from the Introductory Memorandum :—

BANKING IN 1916, AS COMPARED WITH THE
PRE-WAR YEAR (1913).

The statements below give an analysis of the liabilities and assets of the three classes of Banks (Presidency Banks, Exchange Banks, and Indian Joint-stock Banks) as far as balance sheets are available. Although the war came like a thunderclap on a banking world that did not expect it, its effects have on the ordinary business of banking in India now been of comparatively little importance. This

has, indeed, been true to a less degree of banking in the United Kingdom and France. In the balance sheets, set out below, of the operations of the Exchange Banks, the figures for those banks which do a considerable portion of their business in India have been shown separately from the totals for the nine Exchange Banks dealt with. In both cases the figures below represent the Banks' total business in and outside India. The table for Indian Joint-stock Banks deals with thirteen principal banks for which data for all the four years are available. These thirteen banks represent about 56 per cent of the total capital and reserves of all the Indian Joint-stock Banks.

The statistics of 1916 show, when compared with those of the pre-war year, a total addition of Rs. 7,36,00,000 or 15 per cent on both sides of the balance sheet in the case of the Presidency Banks, of £32,696,000 or 14 per cent in the case of all Exchange Banks, and of £24,784,000 or 39 per cent in the case of the Exchange Banks doing a considerable portion of their business in India. The principal Indian Joint-stock Banks, thirteen in number, show an increase of Rs. 2,34,06,000 or 10 per cent,

(a) Presidency Banks.

Year.		LIABILITIES.						
		Capital and reserves.	Percentage of liabilities.	Deposits, etc.	Percentage of liabilities.	Other items.	Percentage of liabilities.	Total liabilities.
		Rs. (1,000)		Rs. (1,000)		Rs. (1,000)		Rs. (1,000)
1913 (pre-war year.)	...	7,45,00	14.7	42,38,37	83.7	80,26	1.6	50,63,63
1914...	...	7,61,00	14.3	45,79,50	84.3	66,87	1.4	54,07,37
1915...	...	7,44,00	14.4	43,49,85	84.0	84,53	1.6	51,78,38
1916...	...	7,33,00	12.6	49,91,45	86.1	75,18	1.3	57,99,63

Year.		ASSETS.							
		Cash in hand at bankers and bullion.	Percentage of assets.	Investments.	Percentage of assets.	Bills discounted and purchased loans, etc.	Percentage of assets.	Other items.	Percentage of assets.
		Rs. • (1,000)		Rs. (1,000)		Rs. (1,000)		Rs. (1,000)	
1913 (pre-war year)	...	16,01,98	31.6	6,67,56	13.2	27,45,94	54.2	48,15	1.0
1914	...	21,56,38	39.9	9,57,75	17.7	22,33,46	41.3	59,78	1.1
1915	...	15,23,69	29.4	12,54,64	24.2	23,18,92	45.0	81,13	1.4
1916	...	18,45,37	31.8	12,44,64	21.4	26,30,35	45.4	79,27	1.4

From this table it will be seen that as compared with the pre-war year the percentages of capital and reserves and bills discounted and purchased, loans, etc., show a decrease. Deposits, cash, and investments have increased. The investments both in

actual amount and as a percentage of assets show a very noticeable increase. The decrease in trade advances was due to the fact that deposits were utilised to a greater extent in war loans.

(b) Exchange Banks.

Year.	LIABILITIES.													
	Number of banks.	Capital and reserves.	Percentage of liabilities.	Notes in circulation (outside India).	Percentage of liabilities.	Acceptances, loans, etc.	Percentage of liabilities.	Miscellaneous credits.	Percentage of liabilities.	Deposits and current accounts.	Percentage of liabilities.	Profits.	Percentage of liabilities.	Total liabilities.
		£ (1,000)		£ (1,000)		£ (1,000)		£ (1,000)		£ (1,000)		£ (1,000)		£ (1,000)
1913 (pre-war year)	9	27,189	11·7	3,950	1·7	45,768	19·7	1,672	·7	151,944	65·2	2,453	1·0	232,976
1914 . . .	9	27,865	13·0	4,363	2·0	39,209	18·2	1,077	·5	140,716	65·3	2,324	1·0	215,554
1915 . . .	9	27,938	13·0	4,087	2·0	27,262	12·7	717	·3	151,866	70·9	2,356	1·1	214,226
1916 . . .		28,273	10·7	5,754	2·2	47,120	17·7	1,073	·4	180,746	68·0	2,706	1·0	265,672

Exchange Banks doing a considerable portion of their business in India.

1913 (per-war year)	5	6,912	10·9	914	1·4	10,650	16·9	610	1·0	43,416	68·7	718	1·1	63,220
1914 . . .	5	7,346	11·7	1,044	1·6	7,487	11·9	330	·5	45,885	73·3	799	1·3	62,891
1915 . . .	5	7,472	10·0	1,085	1·5	7,764	10·4	...	...	57,101	77·0	820	1·1	74,242
1916 . . .	5	7,547	8·5	1,123	1·2	11,149	12·7	...	...	67,306	76·5	879	1·1	88,004

ASSETS.

Year.	Number of banks.	Cash in hand, at bankers, etc.	Percentage of assets.	Investments, etc.	Percentage of assets.	Bills of exchange, etc.	Percentage of assets.	Bills discounted, etc.	Percentage of assets.	Buildings and sundries, etc.	Percentage of assets.	Total assets.
		£ (1,000)		£ (1,000)		£ (1,000)		£ (1,000)		£ (1,000)		£ (1,000)
1913 (pre-war year)	9	27,295	·7	13,058	5·6	92,469	39·7	72,886	31·3	27,268	11·7	232,276
1914 . . .	9	44,939	20·9	15,499	7·2	63,402	29·4	69,473	32·2	22,241	10·3	215,554
1915 . . .	9	42,371	19·8	18,430	8·6	75,519	35·2	65,887	30·8	12,019	5·6	214,226
1916 . . .	9	45,992	17·3	16,587	6·2	107,536	40·5	80,806	30·4	14,751	5·6	265,672

Exchange Banks doing a considerable portion of their business in India.

1913 (per-war year)	5	10,625	16·8	4,343	6·9	16,553	26·2	26,692	42·2	5,001	7·9	63,220
1914 . . .	5	14,491	23·3	6,881	10·9	15,677	24·8	21,651	34·4	4,191	6·6	62,891
1915 . . .	5	15,887	21·3	10,366	14·0	20,652	27·8	23,544	31·8	3,803	5·1	74,242
1916 . . .	5	19,682	22·4	9,057	10·2	27,039	30·7	28,225	32·1	4,001	4·6	88,004

This table shows since the outbreak of war an important growth in the deposits and current accounts, the increase in the case of those banks doing a considerable portion of their business in India being much greater than in the case of Exchange Banks as a whole. Cash investments, bills of exchange, etc., also show interesting increases. The capital and reserves, at a time when

bankers are called upon to write down the value of their investments in consequence of the continued depreciation in their market value, have increased, although the percentage of capital and reserves has decreased, the difference in percentage in the case of the banks doing business chiefly in India being 2·4 as compared with the pre-war year.

(c) Indian Joint-stock Banks.

Year.	LIABILITIES.									
	Number of banks.	Capital and reserves.	Percentage of liabilities.	Deposits, etc.	Percentage of liabilities.	Sundry liabilities.	Percentage of liabilities.*	Profits.	Percentage of liabilities.	Total liabilities
		Rs. (1,000)		Rs. (1,000)		Rs. (1,000)		Rs. (1,000)		Rs. (1,000)
1913 (pre-war year)	14	2,67,83	11·8	19,33,94	85·5	49·41	2·2	12,15	0·5	22,63,33
1914 . . .	14	3,05,93	14·8	16,97,84	82·0	56·18	2·7	9,86	0·5	20,69,81
1915 . . .	14	3,11,33	14·8	17,48,64	82·8	42·15	1·9	9,73	0·5	21,11,85
1916 . . .	13†	2,95,70	11·8	21,27,08	85·2	51·80	2·1	22,81	0·9	24,97,39

Year.	ASSETS.									
	Number of banks	Cash in hand, at bankers, etc.	Percentage of assets.	Investments, etc.	Percentage of assets.	Bills discounted, etc.	Percentage of assets.	Bank Premises, sundries, etc.	Percentage of assets.	Total assets.
		Rs. (1,000)		Rs. (1,000)		Rs. (1,000)		Rs. (1,000)		Rs. (1,000)
1913 (pre-war year)	14	3,75,54	16·6	3,18,61	14·1	15,20,97	67·2	48,21	2·1	22,63,33
1914 . . .	14	2,99,70	14·5	2,75,00	13·3	14,04,52	67·8	90,59	4·4	20,69,81
1915 . . .	14	3,85,77	18·3	3,38,65	16·0	13,30,08	63·0	57,35	2·7	21,11,85
1916 . . .	13†	5,26,90	21·0	3,94,07	15·8	15,10,58	60·5	65,84	2·7	24,97,39

* Including contingency funds.

† One of the banks (the Punjab Banking Co.) was amalgamated with the Alliance Bank of Simla in 1916.

The main features of the working of these banks in 1916, as compared with the pre-war year, are the increased cash balances and investments and the decrease in the bills discounted.

CAPITAL AND RESERVES.

The following table shows the capital and reserves of banks doing business in India in 1916. The Exchange Banks have agencies outside India, and the whole of the capital and reserves of these banks cannot strictly be said to be capital and reserves of Indian banks. It is, however, not possible to estimate what share of such capital and reserves should

be assigned to the Indian branch of their business.

	Capital	Reserves	Total
	Rs. (1,000)	Rs. (1,000)	Rs. (1,000)
The Presidency Banks (3).	3,75,00	3,60,99	7,35,99
The Exchange Banks (10).	34,25,40	22,64,25	56,89,65
Major Indian Joint-stock Banks (20) . . .	2,87,36	1,73,66	4,61,02
Other Indian Joint-stock Banks (28) . . .	51,77	11,50	63,27
Total . . .	41,39,53	28,10,40	69,49,93

It will be seen that the capital and reserves of sixty-one banks amounted to Rs. 69,50 lakhs or £46 millions. The capital and reserves of sixty-five English banks (including the Bank of England) in 1916 amounted to £132 millions. The capital and reserves of Indian banks are thus Rs. 2* (2s. 8d.) per head of population, as against Rs. 44 (£3) in the United Kingdom.

The principal items in the balance sheets of the Presidency Banks, the five Exchange Banks, *i.e.*, those Exchange Banks doing a considerable portion

of their business in India, and thirteen Indian Joint-stock Banks may now be set out below. Comparison is made between the year under review (1916) and the pre-war year (1913).

DEPOSITS.

All three classes of banks contributed to the advance (shown below) in deposits and current accounts, due, so far as India is concerned, to the large profits of firms and mills, especially of jute mills. The deposits and current accounts are the real test of banks.

Deposit and Current Account.

	1913 (pre-war year).	Per cent of liabilities.	1916.
Presidency Banks Rs. (1,000) ...	42,38,37	83.7	49,91,45
Indian Joint-stock Banks (13) Rs. (1,000) ...	19,33,94	85.5	21,27,08
Exchange Banks (5) { £(1000) ...	43,416		67,306
{ =Rs. (1000) ...	65,12,40	68.7	1,00,95,90
Total ...	1,26,84,71	75.5	1,72,14,43
	Per cent of liabilities	Increase + Decrease—	Increase + or Decrease — per cent.
Presidency Banks Rs. (1,000) ...	86.1	+7,53,08	+17.7
Indian Joint-Stock Banks (13) Rs. (1,000) ...	85.2	+1,93,14	+10.0
Exchange Banks (5) { £(1,000) ...	76.5	+23,890	+55.0
{ =Rs. (1,000) ...		35,83,50	
Total ...	80.1	+45,29,72	+35.7

Deposits in the Presidency Banks have increased by Rs. 7,53 lakhs or 18 per cent; those in the Joint-stock Banks by Rs. 1,93 lakhs or 10 per cent; and those in Exchange Banks by as much as £24,000,000 or by 55 per cent. The deposits of these Exchange Banks in India rose from Rs. 23.65 lakhs to Rs 31.54 lakhs or 33 per cent. It is hazardous to offer an explanation of the increase in the deposits in the case of India. It may be that prosperity and higher prices are partial explanations. Favourable monsoons and great demand in belligerent markets for food-grains, raw and manufactured jute and cotton, oilseeds, tea, etc., spell prosperity. The expansion of deposits in the United Kingdom is due, it is said, "partly owing to the withdrawal from abroad of considerable amounts of British money previously employed there, partly owing to the great amount of prosperity which the large outlay in connection with the war has brought to a large number of people, and partly to the rise in prices."

TOTAL DEPOSITS IN INDIA.

The total deposits in all the banks furnishing returns in 1916, as compared with those in the pre-war year 1913, increased from Rs. 97,51,04,000 (£65,007,000) to Rs. 1,13,67,51,000 (£75,783,000). In the United Kingdom deposits in the same period increased from £1,142 millions to £1,658 millions. In other words, the increase in the former case was

17 per cent, and in the latter case 45 per cent. The deposits in banks in India are as follows:—

Year	Presidency Banks and Branches.	Exchange Bank (Deposits in India only).	Indian Joint-stock Banks.	Total.
	Rs. (1,000)	Rs. (1,000)	Rs. (1,000)	Rs. (1,000)
Thirty years ago (1886)...	9,77,12	4,16,60	1,14,86	15,08,58
Twenty years ago (1896)...	15,92,10	10,15,31	5,38,19	31,45,60
Ten years ago (1906) ...	30,52,93	18,08,73	11,55,49	60,17,15
1907 ...	31,47,04	19,17,01	14,00,29	64,64,34
1908 ...	31,87,32	19,51,52	16,26,09	67,64,93
1909 ...	35,84,79	20,27,42	20,49,10	76,61,31
1910 ...	36,58,01	24,79,17	25,65,85	87,03,03
1911 ...	38,58,29	21,16,90	25,29,11	92,04,30
1912 ...	40,11,48	29,53,62	27,25,98	96,91,08
1913 ...	42,37,16	31,03,54	24,10,34	97,51,04
1914 ...	45,65,60	30,14,76	18,37,12	94,17,48
1915 ...	43,49,86	33,54,56	18,78,64	95,83,06
1916 ...	49,91,45	38,03,88	25,72,28	1,13,67,51

* In this calculation the total capital and reserves of the Exchange Banks have been taken into account as the Indian portion of their capital and reserves cannot be estimated.

INDUSTRIES.

Shell Button Trade in Japan.

The following is from a report on the shell button industry of Japan which has been received in this Department from Mr. E. F. Crowe, C. M. G., His Majesty's Commercial Attaché at Yokohama:—

The button trade, like many other industries, has expended considerably in consequence of the war—the exports for 1916 being valued at Yen 9,823,000 as compared with Yen 4,563,000 for 1913.

Of these amounts, about 75 per cent represent buttons made from shell called "Trocas" or "Takase" imported from Macassar, Manila, South Sea Islands and Australian waters; the remaining 25 per cent are made from shells collected in Japanese waters, the most important being:— (1) Hirose from the Loochoo and Bonin Islands. (2) Nanko from the Loochoo and Bonin Islands and Mito on the east coast. (3) Sasae from the Shikoku, and Tsushima Islands, the Inland Sea and Ise Bay. (4) Tamage from Kishu. (5) Awabi from Kiushiu. (6) Freshwater shells or Dobugai from Kasumigaura, Lake Biwa, and other lakes and rivers; also from rivers in China.

On the outbreak of war the export trade declined to some extent, the total export for 1914 being only Yen 3,736,000, but there was more than a recovery in 1915 when the total exceeded Yen 6,000,000, and the next year 1916 saw a further increase of nearly Yen 4,000,000, reaching the figure mentioned above viz., Yen 9,823,000.

Prior to the war, the Japanese button had to compete in the world's markets with Austrian, and to a less degree with German made goods, as regards the cheaper class; and with France as regards the better, especially fancy qualities. This competition gradually disappeared, German and Austrian buttons being no longer obtainable and buyers, particularly those from the United Kingdom and United States, were obliged to turn to Japan for supplies. As the result, orders began to arrive for ever increasing quantities.

Contrary to the manufacturers' expectations, however, these conditions did not bring about an advance in prices, which have steadily declined. Taking the figures paid in 1913 as a standard there was a decline of about 5 per cent in 1914, 7½ per cent in 1915, 10 per cent in 1916, and this year (1917) prices are 15 per cent lower than they were four years ago.

This refers to the Trocas or Takase buttons and to some extent also to buttons made from Tamagai and Chinese freshwater shells. The cheaper class buttons made from Sasae shells were 20—30 per cent cheaper in 1914-15, but rose again to about their former level in 1916-17.

The cheapest class of buttons—Shinjui (Lingah) and "Dobu" (Japanese freshwater shells)—went up 10 per cent in price in 1914, 20 per cent in 1915, and 30 per cent in 1916 where the figure still remains. This is due to the fact that the total available quantity of these shells is limited and is scarcely sufficient to meet the ever growing demand for cheap buttons for export as well as those required for the Japanese underwear trade which has made such enormous strides since the outbreak of the war.

The supply of Trocas shells, on the other hand, kept pace with the growing button industry, as

practically all the former markets for these shells in Europe were either closed altogether or bought very limited quantities only. In 1913 shells were imported to the value of about Yen 1,742,000; in 1914—Yen 1,388,000; in 1915—Yen 2,530,000; in 1916—Yen 3,750,000 or double the amount of 1913. The export trade increased in the same proportion.

The amounts above mentioned include about 5-10 per cent of Chinese freshwater shells, and the following amounts of sundry Japanese shells were also absorbed by the trade: in 1913 and 1914 about Yen 800,000 each year, in 1915 Yen 1,175,000 and in 1916 Yen 1,770,000.

The price of the most important item—imported Trocas shells—has remained about the same since 1913, viz., between Yen 27 to Yen 30 per picul for Macassar and Manila shells, and Yen 20 to Yen 25 for Australian and South Sea Island shells. The latter being coarser and irregular in shape are used for making the cheaper class of Takase button, while the former being straight shaped and of closer and finer texture, are used for making the more expensive fancy buttons.

Although the price of imported shells has remained about the same for the last four years and, as mentioned above, orders for ever increasing quantities continued to pour in, the price of the manufactured article has declined steadily, and at present though the amount exported is twice as much as in 1913, prices are 15 per cent lower than four years ago.

This paradoxical state of affairs has unquestionably been brought about by illtimed over-production and consequent over-stocking of foreign markets, especially America. Foreign, as well as Japanese, firms were not content with executing firm orders, but went in for speculation in the hope of reaping a rich harvest, and made free consignments to their agents abroad. A few parcels may have been sold at a good profit, but when buyers and consumers in the United States noticed more and more shipments arriving, a slump set in, and firms eventually stopped their regular orders as they found they could buy cheaper in New York than in Japan.

The makers made a reasonable profit on the prices ruling in 1913-14 and beginning of 1915, and were able to pay their workmen good wages, so that as time went on more and more labour was attracted to the button factories. The workmen are paid according to the amount and quality of their work, the most skilful being able to earn up to Yen 3'00 aday, which is a good wage for this class of labour in Japan.

The initial work of breaking up and preparing the shells for button making is done by women and children who are paid 20 to 30 sen a day. Boys, who get a little more, do the cutting out of the rough blanks or disks in various sizes, by machine. These are then smoothed down to unequal thickness by women, and handed to the more skilful workmen for holing and shaping. After this the buttons go through a bleaching process, where they are finally cleaned and polished.

With the present low price of buttons,—shells being just as dear as before—makers have had to cut down their wage bill, and this is already driving quite a number of the workmen to other trades. In time production will be reduced, free consignments will stop, and buyers, in order to get goods, will have to order as before in Japan at higher prices, which will improve the situation of the workmen and makers. [Yen=Rs. 1-8-6.]

MYSORE ECONOMIC CONFERENCE.

Agricultural Committee.

The following is a brief report of work done during the month of January, 1918:—

Pony Breeding.—The recommendations of the Mysore District Committee that stallions maintained by Government should be sent round to the Taluks where pony breeding is a subsidiary occupation were considered, and Mr. H. Rangaswami Iyengar, G. B. V. C., Member of the Committee, was requested to submit a note on the subject, after visiting breeding centres in the Mysore and Kolar Districts. The Agricultural Committee are inclined to think that if pony farms were started in each district, the requirements of individual taluks could easily be met.

Horticulture.—(a) The Committee sanctioned the purchase of garden tools for the use of the Horticultural scholars. (b) An application from Mr. B. N. Gudiyappa of Kolar for a loan of Rs. 1,000 to develop cocoanut cultivation was referred to the President, District Committee, Bangalore, for opinion.

Commercial Crops.—Tea. The Secretary brought a proposition at the last meeting that a free grant of 500 acres of suitable land should be made to individuals or syndicates willing to pioneer the tea industry. The Committee were of opinion that before this could be profitably done, an expert should be appointed to make a preliminary survey of tea lands and submit a report furnishing complete data for determining the lines on which the industry should be developed.

Cotton.—The Committee has recommended a loan of Rs. 5,000 to the Cotton Seed Syndicate of Davangere, free of interest, on condition that suitable arrangements be made to secure good seed.

Live-Stock.—An application from one P. R. Rajamma, for a loan of Rs. 1,000 to buy sheep to facilitate her carrying on work in worsted articles has been referred to the District Committee of Bangalore, for investigation and opinion.

A hybrid Merino ram has been supplied, at the instance of the Deputy Commissioner of Tumkur, to Mr. Kari Siddalingiah of Kitaganahalli.

The Committee sanctioned the purchase of dipping accessories for the Sheep Farm and authorised the Secretary to arrange for the grazing of the sheep in the Committee's possession, pending the organization of the Government Sheep Farm at Pillaganahalli.

The *Hallikar* bull at the Government Veterinary Dispensary, Bangalore, was disposed of, as it was

getting old, and it is proposed to purchase two Ongole bulls to replace it. The problem of improving the milk strain of the local cow is receiving attention with a view to meet the increasing demand for milk.

Co-operation.—The necessity for starting co-operative organizations for cattle insurance in breeding centres and for the sale of copra at Tiptur is under study.

General.—The Committee, while considering the programme of the Mysore Agricultural Department prepared for the Board of Agriculture, indicated in what directions they could supplement the work of the Department and what additions could be made to the items of work noted therein.

The following is a brief report of work done during the months of February and March, 1918:—

Co-operation.—The scope for co-operation in the agricultural economy of the State is being studied, especially in regard to problems connected with sugar-cane cultivation, cocoanut gardening and production of silk. A good deal of first hand investigation has been done and definite lines of work are being determined.

Horticulture.—Owing to the general rise in prices, the tentative price list of fruit plants published in Government Order No. 6472-85—A. & E. 45-16-7, dated 12th February, 1917, has had to be revised. Messrs. M. Rudrappa and Son have kindly agreed to accept rates much lower even than those suggested by the Offg. Superintendent of the Government Gardens, out of a sincere wish to assist in the spread of fruit culture in Mysore.

There is every evidence that interest in this branch of work is growing, the latest indication being furnished by the request of the Mysore District Committee for an additional Inspector to cope with increased demand for expert advice. In pursuance of an arrangement with the Director of Agriculture, gardening tools and vegetable seeds have been stocked for sale with the Agricultural Inspectors in each District.

A request has been received from the Mysore District Committee for a contribution of a half of the expenses of two fieldmen whom they propose to employ. Further details of the scheme have been called for.

Poultry Farming.—The Committee have recommended to Government the sanction of a loan of Rs. 600 to one Kadasetti of Nerle village, Nanjangud Taluk, to enable him to develop his poultry farm.

Extension of Agriculture.—The Committee have been keenly alive to the urgent need for improving

the *gomal* lands which represent a valuable national asset. At the last meeting, various proposals for rescuing *gomals* from the neglect into which they have everywhere fallen, by appealing to individual interest in their proper maintenance, were discussed, and the question was referred for comprehensive treatment to a strong Sub-Committee, who have recommended that the communal nature of the lands should be preserved; but that steps should be taken to keep *gomal* in condition by the performance of specific agricultural operations at stated intervals.

Special Crops: Indigo Cultivation.—As it is probable that there will be a good market for natural indigo for four or five years to come, the expediency of deputing an officer of the Agricultural Department to Pusa and other parts of British India to study processes of manufacture is under consideration.

Sheep Farm.—Through the courtesy of the Superintendent, Government Military Dairy, Quetta, thirty Dumba sheep bearing heavy white wool have been secured for the sheep farm during the month. These, as well as the local ewes purchased in the neighbourhood of Kunigal, have been left on private grazing lands at Deutramanahalli by special arrangement, pending the location of the sheep farm at Pillaganahalli, on which Government Orders are awaited.

District Conferences.—The Secretary attended the District Conferences of Mysore, Kadur, and Bangalore, took part in the discussion of agricultural subjects and delivered addresses on the economic importance of fruit growing and silk production in the agricultural life of the country.

The Committee's executive staff in the Districts gave an encouraging account of work done in the year at the Conferences.

Bulletins.—The following bulletins and leaflets have been published since the beginning of the calendar year 1918:—

ENGLISH.

- i. Selections from leading Agricultural Journals.
- ii. Watering crops.
- iii. Digging wells.
- iv. The method of tank repairs.

KANNADA.

- i. Tobacco cultivation at Bettadapura.
- ii. Improved methods of sheep breeding.
- iii. Home remedies for live-stock.

N. RAMA RAO,
Secretary.

Education Committee.

The following is a brief statement of work done by the Education Committee during the months of January and February, 1918:—

SCHOLARSHIPS TO DEPRESSED CLASSES.

The allotted amounts were placed at the disposal of the Deputy Commissioner-Presidents, who have been informed that they could utilize the amounts for scholarships for Industrial training, fixing the rates according to local needs. The District Committee of Kadur has awarded three scholarships of Rs. 8 each for Industrial training.

Government sanction in the matter of the utilization of the savings out of the grant of Rs. 15,000 allotted to the Depressed Classes for buildings and other purposes was solicited. But in their reply No. 7,290/ Ed. 96-17-11 dated 22nd January 1918, they were pleased to order that this amount should be expended on scholarships alone. The President of the Government Panchama Boarding School, Mysore, however, suggests that the amount allotted for the benefit of the Depressed Classes may be placed at his disposal for the erection of a new suite of buildings attached to the present one, which he thinks is an urgent necessity.

EDUCATION OF THE DEPRESSED CLASSES.

The Committee made further recommendations to Government regarding the Education of the Depressed Classes. The principle features of the proposed scheme are:—

1. A Boarding School at each Taluk Head-quarter.
2. Higher rates of scholarships, at least Rs. 10 per pupil,
3. Higher salaries than for other classes, when entertained in Public Service.

The following recommendations of the Committee were approved:—

1. That neither Mysoreans studying outside the State nor Non-Mysoreans studying in the Schools and Colleges within the State should be considered eligible for scholarships under the Backward Classes scheme.
2. That the Committee do re-allot amounts which have lapsed in any District or in any grade.

A tabulation of the results of awards shows that the scholarship-holders are comparatively very few from the interior of the Districts, most of them being residents of Head-quarter towns, and the

number of scholarships awarded to each community is not, as contemplated in the orders of Government, proportionate to the respective population.

With a view to providing a satisfactory check on those disbursing the scholarships, a draft Intimation Slip was drawn up by the Chairman of the Sub-Committee and modified by the Chairman of the Education Committee. The Comptroller and the Inspector-General of Education have suggested further modifications.

The Scholarship Committee submitted to Government a recommendation to the effect that the working of the Scholarship Scheme should be handed over to the Education Department, as the experimental stage was nearly over.

TRAINING PUPILS IN LOYALTY, PATRIOTISM, etc.

With a view to training pupils in the first principles of loyalty, patriotism, self-discipline and

Esprit-de-corps, the following recommendations were made to Government regarding the adoption in all schools of the following:—

Common prayers in Kannada, moral lessons and discourses on loyalty, patriotism and *Esprit-de-corps*, the wearing of Uniform and Crest with Motto and the saluting of the flag "Ganda Bherunda."

The appointment of a Ceylonese expert as Scout Organizer or Commissioner was also recommended to Government.

POPULAR LECTURES.

Ten lectures in Kannada by the members of the Kannada Popular Science Association on Science subjects, one lecture on Printing, and one on the Scientific Training of Body and Mind were delivered under the auspices of the Committee.

J. S. CHAKRAVARTI,

V. SUBRAHMANYA IYER,

Chairman.

Secretary.

Statement of Progress relating to the Home Industries Institutes of Bangalore and Mysore.

No.	Sections	Home Industries Institute, Bangalore				Home Industries Institute, Mysore	
		Details of Main Head		Sale Proceeds		Details of Main Head	Sale Proceeds (Jan. 18.)
		November	December	Nov.	Dec.		
				Rs. a. p.	Rs. a. p.		Rs. a. p.
1	Affiliated Classes	20 Classes	20 Classes	321 10 7	362 10 5	26 Classes	189 13 7
2	Demonstration Classes.	1. Machine Knitting	1. Machine Knitting	.....	.....	1. Bamboo Demonstration Class	2 6
		2. Tape Weaving	2. Tape Weaving	.....	.....	2. Knitting Demonstration Class	Nil
		3. Hammock Making	3. Hammock Making	.....	.....		
		4. Wool and Dress Making.	4. Horn Articles	.....	.....		
		5. Horn Articles	5. Embroidery and Plain-stitching	.....	.....		
		6. Paper Manufacture.	.....	.....	.....		
3	Home Workers	25	50	29 6 0	62 10 0		

Report of progress made by the Home Industries Institutes of Bangalore and Mysore for January, 1918.

No.	Main Section	The Bangalore Institute			The Mysore Institute		
		Details of Main Head	Value of work done	Value of articles sold	Details of Main Head	Value of work done	Value of articles sold
			Rs. a. p.	Rs. a. p.		Rs. a. p.	Rs. a. p.
1	Affiliated Classes	26 Classes	453 13 6	292 2 0	26 Classes	656 0 3	149 9 10
2	Demonstration Classes	2 Classes	5 0 4	.....	3 Classes	...	...
3	Home Workers	30	78 10 0	342 2 0	70 Additional Home Workers were registered	...	...
4	Museum and Library	Continues	to be popular		Has	been	opened

The following is a report of work done during March, 1918:—

The Education Committee again recommend that scholarships of all kinds should be co-ordinated; maintaining a distinction between the 'Close' and 'Open,' and between scholarships awarded to pupils who are the permanent residents of head-quarter towns and pupils who come from the interior. They also urged that scholarships should be provided for encouraging Higher Vernacular Education.

Home Industries.—The question of the introduction of electrical appliances was again considered and it was resolved that a Committee consisting of Mr. Forbes, Mr. Yegnanarayana Iyer and the Secretary of the Education Committee should be formed with power to co-opt other members for formulating definite proposals. It was also proposed that Rs. 3,000 be placed at the disposal of Mr. Forbes for making necessary experiments in this connection to enable him to determine which appliances would be most profitable and suitable.

Educational Survey.—A Sub-Committee consisting of Rajakaryaprasakta Rao Bahadur Mr. M. Shama Rao, Mr. C. R. Reddy, Mr. C. Krishna Rao, Mr. M. Basava Iya and the Secretary of the Education Committee was formed to revise the form prepared by Mr. C. Krishna Rao and to suggest practical measures to be adopted. The Committee met on the 21st and resolved that the work be entrusted to the Education Department.

The Training of Convicts in Improved Methods of Agriculture on the lines suggested by Mr. A. K.

Yegnanarayana Iyer was considered and a recommendation made to the Inspector-General of Prisons in Mysore.

Co-operation as a Subject of Study in Schools.—The Committee considered the question of making Co-operation one of the subjects of study in schools and colleges in consultation with the University Council and the Inspector-General of Education. The Committee decided that the proposal was not a feasible one.

Introduction of Jiu-Jitsu.—The question of introducing Jiu-Jitsu in all High Schools and Colleges was discussed in the light of the opinions received from the Inspector-General of Education and the University Council. A recommendation was made to Government that it might be introduced.

Outlines for a book on "Methods and Machinery of Business" as well as for a course of instruction in the subject was considered.

Libraries.—The recommendations of the Mysore and Bangalore Libraries regarding the opening of Women's and Children's sections were approved and a recommendation was made to Government for the grant of a suitable plot of land for erecting a lavatory for the use of members of the Bangalore Library.

Publications.—A booklet on Functions of District Committees in regard to the work of the Education Committee was published. A bulletin on Free Secondary Education was issued.

J. S. CHAKRAVARTI,
Chairman.

V. SUBRAHMANYA IYER,
Secretary.

PROGRESS IN THE DISTRICTS.

Chitaldrug.

AGRICULTURE.

A Vegetable Garden.—A vegetable garden was formed in the Molakalmuru Taluk.

Improved Ploughs.—Nine iron ploughs were supplied to the ryots of Holalkere and Molakalmuru Taluks and an order was placed for five more Meston's ploughs.

Sugar-cane Cultivation.—Two lakhs of sugar-cane have been sown under the Yemmehatty and Hampanur Tanks in the Chitaldrug Taluk.

Supply of Cotton Seed.—Regarding the arrangements to be made for the supply of good cotton seed to the cotton growers the District Committee resolved that in view of the grave consequences to which the cotton growers are exposed by the present indiscriminate supply of seed, it is extremely necessary that a cotton seed syndicate be formed at Davangere with a capital of Rs. 10,000 for making necessary arrangements for the selection and supply of good seed cotton and that Government be requested to advance half this amount as a loan to the syndicate free of interest. Further needful action is being taken in the matter.

EDUCATION.

A Reading Room.—A Reading Room was started at Chellakere on the 1st December, 1917.

Libraries.—Three libraries were started—one at Bharpura, another at Chinnobanahalli and third at Chikkabyaladakere. A Juvenile Library was started at Chellakere and book to the value of Rs. 80 were purchased.

New Schools Opened.—Three night schools, two aided schools, one private school and one Lambani school were started in the Molakalmuru Taluk. One night school was newly opened in Amaravathi in Harihar Sub-Taluk.

A School Building.—A sum of Rs. 100-15-11 is reported to have been contributed for constructing a school building at Sirigere, Harihar Sub-Taluk.

INDUSTRIES AND COMMERCE.

Practical Instruction Classes.—The question of starting practical instruction classes in the Chitaldrug town was discussed and it was resolved to start the following classes:—(1) A home industries class for training women in rattan work; (2) A practical instruction class for dress making and sewing; (3) Nakki and tinsel work; and (4) A practical instruction class in tailoring attached to the Normal School.

Rural Industries.—The District Committee approved the suggestions of the Sub-Committee that the following rural industries be taken up in the District:—(1) Basket and mat making; (2) Rope making; (3) Fibre extraction; (4) Oil extraction; (5) Manufacture of coarse cloths; (6) Blankets; (7) Bangle making; and (8) Making of walking sticks and Rice pounders.

CONFERENCES AND MEETINGS.

Bowringpet Taluk Conference.

The fourth Taluk Conference was held in the King Edward Hall at Bowringpet on the 8th February, 1918, with Mr. B. Venkoba Rau, B.A., Deputy Commissioner, in the chair. The proceedings commenced at 1 P.M. with a few introductory remarks from the chair. The Amildar then read a report in English of the work done during the nine months ending 31st December, 1917. The Taluk Sheristadar next read the same report rendered into Kannada. From this report it is seen that the number of Government Schools was the same as in the previous year and that only one grant-in-aid school was started during the period under review. The number of private schools had, however, increased by five, there being nineteen institutions now. Seven night schools were newly started and the number of persons attending the night schools is reported to be 210. Fourteen improved ploughs and four cultivators were sold during the period, and there are now fifty-four ploughs and eight cultivators in use in the Taluk. About 630 fruit plants were supplied to five ryots of the Taluk, and twenty-three persons have planted 2,563 cocoanut plants in ten villages. In connection with the *Jatra* of Sri Kothanda Ramaswami, a cattle show was held at Bowringpet for three days and cash prizes to the extent of eight rupees and two English ploughs were awarded. Demonstrations in ploughing were held every morning and agricultural lectures were also delivered on all the three days. During the period under report all the remaining village improvement committees were formed. There are at present 137 such committees serving all the 410 villages in the Taluk. During the period under report sanction has been accorded for the following works:—

	Rs.
Eight Village Halls ...	3,850
Ten Schools ...	8,716
Tunnels and roads ...	1,120
Total ...	13,686

The villagers' share of contribution for all these works comes to Rs, 6,843. All these works are in progress and will be completed before the close of the year.

After the reading of the report lectures were delivered on Education, Co-operation, Industries, Economic Development, etc. Mr. Narasimha Iyengar, Veterinary Superintendent, spoke on cattle breeding, cattle diseases, and dairy farming. The minor and major wants of the people in the Taluk were then freely discussed and important resolutions were passed. A member of the Bangalore Sree Sharada Samaj addressed the audience on Female Education and appealed for funds. In bringing the Conference to a close the Chairman briefly reviewed the work done by the Taluk Progress Committee and exhorted the people to associate themselves with local officers in developing schemes for the well-being of the ryots and general progress of the inhabitants of the Taluk in all directions. The Amildar proposed a vote of thanks to the President and the meeting terminated with three cheers for their Highnesses the Maharaja and Yuvaraja of Mysore and the singing of National Anthem.

CORRESPONDENCE.

To
The Editor,
Mysore Economic Journal, Bangalore.

The Madras Exhibition.

Sir,—There are some persons who hold that the annual Exhibitions are a mere show tending to the wastage of money, time and energy. But there are many others who think otherwise. They are rightly of opinion that a year may bring about several changes and developments in the Industrial World. These annual Exhibitions mark the march of progress of the world in Education, Agriculture, and Industries and they afford us an opportunity of taking of stock of the Economic Work turned out under the ægis of the Mysore Economic Conference. As the Dasara Week in Mysore is utilized for the holding of conferences, exhibitions, assemblies, lectures—all of educative and economic value, the Christmas Week is utilized for similar purposes in the big cities of British India. Hence we have at Madras this week an Exhibition opened by no less a personage than H. E. the Viceroy of India. To Mysoreans who went to the Madras Exhibition, it had a peculiar significance; both Mysore and Madras are agricultural provinces and they are vying with each other in healthy rivalry in showing to the world what India can do if opportunities are given to her in the matter of economic development.

We have as much to learn from the Madras Exhibition as the people of Madras have to from our own. The presence of our Dewan there at the Exhibition grounds was an assurance to us that our Dasara Exhibition next year promises to be a greater success than it has ever been. Last time we had excluded all foreign machines for very obvious reasons and their place was taken by machines from our industrial Work Shop. From the Agricultural section of the Madras Exhibition we learnt that the growing of indigo may be attempted in our State to a greater extent. The system of joint village sales of cotton now practised in thirty villages in Tinnevely was of some interest to us. The quantity and quality of cotton and ground-nut grown in our State needs improvement. As regards the planting Industry, we have to improve in Rubber planting. We suffer in common with our friends outside in the matter of good markets for Coffee and H. E. the Viceroy's observations and sympathies apply with equal force to the planting communities of Mysore.

In the matter of Industries we lag behind very much. We Mysoreans have been just trying to interest ourselves in the matter of industries. We have asbestos both crude and refined of which we have not as yet made any practical use. Pottery and Silica bricks which are required for furnace linings and are essential to the Indian Iron and Steel Industry may claim notice of the Mysore Industrial Department. If pottery and cutlery works are a success in Gwalior why not we also try? Our Clay Expert is of opinion that we have good clay in abundance for our pottery and tile works in certain parts of the State. We can make a good start. As regards cutlery it is true we have no iron, but we may rely as our neighbours do on scrap-steel such as old files and discarded rails. Glass industry in Mysore is bound to be a success if ways and means are found.

Fisheries, of which we hear nothing in Mysore owing to the country being an inland one, can find a place amongst local industries inasmuch as we have big lakes, streams and rivers abounding in fish. A smaller staff can try and work these out. The only satisfaction we have is the newly started Sandal-wood Oil Industry, of which we may be proud. The Indian Institute of Science is making strenuous efforts to carry out experiments and researches in different Chemical industries, to show which industries can be profitably taken up and developed in India. The photographs of the factory in Mysore and the Sandal-wood framed photographs from Bangalore Factory have elicited much praise from several quarters.

M. S. RAMACHAR,
*Economic Superintendent,
Kolar District.*

BOOKS IN BRIEF.

Indian Painting.—By Percy Brown, A.R.C.A., Principal, Government School of Art, Calcutta. The Association Press, Calcutta.

We have no hesitation in saying after this little book—it is only 100 pages—that Mr. Percy Brown fills by it a long felt want. Much has been written on Indian arts and crafts, and on sculpture and archæology in recent years. Much has been added to the work of that great pioneer in these matters, Dr. Fergusson. But this little book of Mr. Brown is about the first book of its kind on Indian painting as such and is, therefore, welcome. In a brief introduction, Mr. Brown touches on how eventually the existence of Indian art has been recognised by Western people and the classes into which the art is generally divided in India itself. What he says about the authorship of the paintings of the Buddhist period is probably correct. We note with pleasure that Mr. Brown devotes some attention to South India. The Deccan artists and the artists of Tanjore and Mysore receive their meed of praise. In Tanjore, painting was closely associated with the reigning Mahratta family and it did not survive its end. In Mysore, painting reached its highwater mark under His late Highness Krishnaraja Wodeyar III. Mr. Brown writes thus of this ruler's love of the art:—

“The other southern development of the art—the Mysore School of Painting—reached its highwater mark under the rule of Raja Krishnaraja Wodeyar, in the first half of the nineteenth century. Previous to this, however, the school is known to have been a flourishing one for more than a hundred years. Under the personal supervision of Krishnaraja the court artists enjoyed a great reputation, and it is recorded that this Raja's keenest delight lay in encouraging the painters to compete one against the other in depicting some subject selected by this royal connoisseur. Like the Tanjore artists, they executed much portraiture on ivory, a collection of which was displayed in the Mysore Palace. On the death of Krishnaraja in 1868 these artists were dispersed and the school became extinct.

The book is fully illustrated and deserves to be widely read.

Native Life in South Africa (before and since the European War and the Boer rebellion).—By Sol. T. Plaatje, Editor of *Tsala ea Batho*, Kimberley, South Africa. P. S. King & Son, Ltd., London.

This is a spirited protest against the Native's Land Laws, current in South Africa under which no kafir can buy a farm or hire a farm. According to a good authority but for the colour bar, Mr. Plaatje would,

in all probability, have been holding an important position in the Department of Native Affairs in South Africa. As it was, he entered journalism, and has been Editor of a native South African paper financed by a native South African Chief. It is clear that he is a man of influence in his community; also a man of tact and great abilities. More than all this he is possessed of enthusiasm and he has carried his protest to the very doors of the Imperial Government. Whatever may be the outcome of his mission, it is undeniable that the continuance of the state of affairs he depicts cannot but do injury to the Economic progress of South Africa as a whole. There is one chapter (VI) in this book to which we would draw particular attention for it brings out in strong relief the true feelings of the natives of South Africa towards kindly and just Dutch landowners. The point in issue seems one capable of satisfactory re-adjustment and the sooner a settlement is arrived at the better it is likely to be for the future prosperity of the country.

Davar's Higher Accounting with Auditing Notes.—By S. R. Davar, Bar-at-law. Principal, Davar's College of Commerce, Bombay.

This is a book intended for the use of Indian students of accountancy studying for the examinations by the Professional Examinations Board of England as well as the London Chamber of Commerce, the Accountancy Diploma Board, the Bombay University specialised Accountancy Examinations, etc. Mr. Davar's long experience as an Accountant and lawyer has enabled him to produce a book which is a model of what it should be. It deals with the Indian legal and professional principles involved in a clear manner and makes what would otherwise be difficult even for the advanced student a mere matter of study and practice. The law bearing on the subject is stated in intelligible language and the illustrations and question papers included seem to be framed as much to explain the principles as to test the student's grasping powers. The work is thoroughly practical in character and those who have to do with Company accounts would do well to keep a copy of it handy for use.

ACKNOWLEDGMENTS.

Some Scale Insect Pests of Coffee in South India.—By Leslie C. Coleman, M.A., Ph. D., Director of Agriculture in Mysore, and K. Kunhikanan, M.A., F.E.S., Senior Assistant Entomologist, Department of Agriculture, Mysore State. Price one Rupee.

National Economy.—An Outline of Public Administration. By Henry Higgs, C. B. Macmillan and Co., Limited, London. 3s. 6d. net.

We have gone through Mr. Narayan's *Typewriting Manual* (Y. Narayan, Underwood Typewriter Agent, Madras) with great care and attention. It is a *Manual* written by a practical typist for those who wish to become good working typists in public offices and commercial houses. The *Manual* is written in a very clear and simple language and is profusely illustrated. With its aid one can not only learn the art of typing but also attend to some repairs at a pinch. We commend the book to all learning or desirous of learning typewriting on the Underwood Typewriting Machine.

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AN ALL-INDIA ECONOMIC CONFERENCE.

BY ALBERT J. SAUNDERS, M.A., F.R.
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IT gives me pleasure at the request of the Editor of the *Mysore Economic Journal* to present to the readers of the *Journal* a brief report of the recent Conference of Economists held in Calcutta, January 3-4, 1918. You will observe that I have called the meeting a Conference of Economists from various parts of India, for that is really all it was, but in reality it was the first meeting of a movement which looks towards the formation of an All-India Economic Conference.

As many of your readers will know there is in England a British Association—that is, “The British Association for the Advancement of Science.” That great organization comprises all branches of science. Economics is received as a science, and it has its own properly constituted annual Economic Conference as a part of, and under the auspices of the British Association. It is to be regretted that up to the present time the Indian Science Association has not seen its way clear to accept an Economic Conference as a part of its legitimate activities. That being so economists in India have decided to form their own organization, and pursue their own course working for the economic development of India.

Professor C. J. Hamilton of the University of Calcutta was the prime mover in this first meeting, and under the auspices of the Bengal Economic Association he issued invitations to a large number of economists in various parts of India to attend a conference to be held in Calcutta. About thirty teachers and students accepted the invitation and attended the Conference from such centres as Calcutta, Allahabad, Lahore, Patna, Bombay, Madras, Madura, and Poona. We were sorry that several whom we should like to have seen present excused themselves at the last moment, among them being Professor Kale of Poona, and the Editor of this *Journal*.

The sessions were held in the Legislative Council Chambers in the Writers' Building. In all there were four sessions extending over two days. I will not attempt to summarise the papers that were read, and the discussions which followed the papers. The papers are to be printed in a special conference number of the *Bengal Economic Journal*, and those who wish to read these contributions to current economic problems are referred to that Journal. I may, however, submit to you a copy of the programme which enjoyed the attention of the Conference. Professor C. J. Hamilton was the Chairman and delivered an able Presidential address. Mr. Hamilton has visited Japan on two occasions recently to study the economic development of that country, and so was well qualified to and did offer advice to India from the experience of Japan.

The First Day. Morning Session.

Subject: Labour in relation to Economic Development.

Papers dealing with this problem were read by Professor Stanley Jevons (Allahabad), Professor J. C. Kydd (Calcutta), and Professor E. A. Horne (Patna).

Afternoon Session.

Subject: Economic Development in South India.

Papers were submitted by Professor Gilbert Slater (Madras), Professor Albert J. Saunders (Madura), and Professor Burnett-Hurst (Bombay).

Second Day. Morning Session.

Subject: The Currency Problem.

Papers were written by Professor J. C. Coyajee (Calcutta), Professor B. F. Madon (Bombay), and Professor Gilbert Slater, (Madras).

Afternoon Session.

Subject: Co-operation in relation to Economic Development.

Papers were read by Professor K. N. Bhattacharya, Professor J. S. Chakravarti, and Professor I. B. Saksena.

If I am not mistaken all the last named speakers were from Calcutta. On the Thursday evening a very pleasant conversation was held in the rooms of the Royal Asiatic Society, when it was resolved to make this conference an annual gathering. A committee was appointed to consider the question of a permanent economic organization, and the further question of a Journal to be the recognised organ of the Conference. One need hardly say that all those who attended the sessions pronounced the Conference a great success, and we feel deeply indebted to Professor Hamilton and Bengal Economic Association for initiating this movement.

I am asked for my opinion on the utility of such a conference as the one just concluded. In reply I will say that I think it was, and such conferences always are, worth while, because of a number of reasons. Among the reasons one may mention are the following: In the first place the delight-

ful fellowship of men engaged in a similar work. One gets to know the name of another through a magazine article, a book or a letter; and we often say—yes, I know him by name. But to meet that one, to shake his hand, to talk with him about the pleasures and problems of a common task is another and very different thing. India is so large, and her problems so many that her teachers and students of economics need a large and representative annual gathering for the purpose of keeping in touch with one another, for the purpose of gaining first-hand information of local conditions, and for the development of an *esprit de corps*.

Such a conference has an academic interest. Men, often specialists, speak with a certain amount of authority on economic problems. The discussions are always helpful. It is the laboratory where economic theory can be criticised and perhaps restated before it is tested in the practical experience of everyday life. Very often such conferences are the seed plot out of which comes forth the harvest of action and reform. Many people look upon a mere conference as too academical, as visionary or theoretical. But such people forget that in the history of scientific progress the academical and theoretical have always come first, and out of the discussions of the few have come the practical reforms to benefit the many. Was it not so in connection with the Repeal of the Corn Laws and the passing of the Factory Acts in England, and the abolition of slavery in America! Is it not true of all advancement in science! The laboratory is absolutely necessary, it must come first, and then the factory is built to produce. Likewise in a well ordered society the scientist should have a place, he should be allowed to investigate, to confer, to propose; and the politician or man of affairs will pass into action. That is what we need to-day—a proper recognition of the worth of the man of science to the economic good of society. His work is often limited to his laboratory, it is academical, but as it has so often proved—there is the dynamo generating light, and there are the springs of action.

I do not wish to give the impression that such conferences are wholly academical and expend themselves in theoretical discussion. There is a distinctly practical interest. Such conferences have a practical objective;

they are not ends in themselves, they are means to an end—economic reform. After all the function of the teacher is not to do the thing himself, is it not rather to inspire and instruct his pupil to do it! Still, in all such conferences there might well be a strong executive committee which shall seek during the year to make operative the suggestions and resolutions made at the annual conference. Representations with the full support of an All-India Economic Conference on economic reforms, made to Municipalities, Chambers of Commerce, Provincial Governments, or the Government of India would have great influence, and it seems to me that it is along these lines that such conferences should develop, and may have practical interests.

And then again, I think that such a conference as is proposed will have a utility in India because of the experience of similar organizations in other countries. Reference has already been made to the English Economic Conference of the British Association. Many years of valuable service, and the standard publication—*The Economic Journal*, amply justify the existence of that organization. In America there is the Western Economic Society with headquarters in Chicago, and other similar societies as well, which are doing noble work for national economics. European countries, especially Germany, have not been behind in their national societies to promote national ends. What has been done in other countries can at least be attempted in India. One cannot afford to forget the splendid work being done by the Mysore Economic Conference, and its organ the *Mysore Economic Journal*. Here is an effort to blend together in one organization the theoretical and the practical. This Conference is peculiarly fortunate in being a Government institution, and having a State in which to try its economic experiments. So far as I know this Conference is unique in that respect, and has therefore a magnificent opportunity to carry out economic reforms. But when, whether under State control, or by private initiative, qualified men gather together to propose, to discuss, and to try to carry out measures of economic reform for the common good they are to be commended as among the real promoters of progress, and among the true saviours of a people.

PERSONALITY: AN ASSET.

BY GEORGE EDGAR,

Formerly Editor, "Modern Business."

TO-DAY there are people who say the personal qualities of a man are more important to his success in business than any other ability he may possess. Any one who knows the world of business at the top will agree with this opinion. To-day where you find leaders of men, there in the main are the dominating personalities. Perhaps it has always been true that personality with ability will go further than ability alone. The modest efficient man gets a good place and is well found in work and wages, but he rarely occupies the centre of the stage where leaders monopolise the limelight. The magnetic personal qualities of the successful man have been apparent in every age and generation, and amongst all nationalities. The value set on personality to-day stands higher than ever it did before, in a world tending to standardize everything and everybody. The habit of referring to groups of a thousand workers as "hands" is not without significance. Closer organization, the passing of industrial direction into fewer hands, the development of machinery, and the reduction of vast numbers of men who, in other days would have been skilled craftsmen, to the level of mere minders of machines, all are influences playing a part in enhancing the value of personality. The man who steps from the ranks to anything like an assured position in life to-day, must have the forceful qualities we define as personality.

Before appreciating what personality may do for the man it is necessary to define the meaning of the word itself. The dictionary definition describes personality as "that which constitutes individuality; self-conscious, self-determined power," and for

work-a-day purposes the definition is fairly sound. Personality is a mixture of many influences, but the manner of its employment certainly implies an individual outlook and the self-consciousness which permit a man to determine his actions without being too much obsessed by precedents. When one looks at the conventional definition, an important fact emerges. Personality is really a matter of physical strength and fitness. Clear thinking, self-reliance, the individuality implying originality—the power to control one's purpose in life must in the end be a matter of robust physical condition. I recall the first direct impression I received that the secret of personality is really physical strength. I dined at a club in London, which draws together men who count in their particular activities. The membership list includes some of the most distinguished workers in London. I recall the guest of the evening was the late Lord Strathcona, perhaps Canada's greatest personality, who carried a wonderfully successful career over a span of years seldom vouchsafed to man and died rich in honour at the age of ninety-four. Around him were men who had succeeded in many walks of life. There were present a distinguished explorer, a popular judge and many well known members of the Bar; leaders in music, the theatre, art, literature and journalism—all men who had succeeded, and were cutting considerable figures in the world. It struck me then, and has remained an abiding impression ever since, that these men had personal qualities different from those possessed by the average man. When one analysed the impression, the qualities could be explained in physical terms. If you take a group of successful men you will find they have in common the power to suggest unusual strength and physical energy. They have bigger heads, usually bigger features, large eyes set wide apart, longer or more prominent noses, big strong mouths, fine teeth, very often they have

even larger ears than the average man. As a rule, size for size they will average heavier men than most of their fellows, though the rule of bulk does not always apply. I do not mean to suggest that exceptional ability is a matter of beef, or logically Daniel Lambert would have been a genius. My idea is, the personality of successful men radiates a note of physical capacity. They look able to work long hours and maintain a high quality of concentration during the period of activity. When they are about their pleasures and go in for hobbies or amusements they appear more receptive in their leisure than other men. If my reading of the riddle is right, personality is most of all a matter of efficient physical make-up.

That personality is an asset no one will doubt. One sees its triumph in a hundred different fields. What quality took Kitchener from the lowest commissioned rung in the army to the highest? Personality must be the answer. Such cases of success are common, and behind them there is always personality. A notable instance of the triumph of personality was the steady advance made by John Burns, from a platform in Trafalgar Square and the lowest rung of labour leadership to a seat in the Cabinet and the control of a great Government department. Equally dramatic was the rise of Carnegie, a poor Scotch boy, who lived to control the iron and steel industry of America. Personality counts with the same or more significance in the theatre. Henry Irving, without influence, handicapped by physical disadvantages, and after distinct failures, marched steadily to the leadership of the English stage. His title, the first given to the profession, was a proof that Irving not only was our most representative actor, but that his presence in his chosen profession had ennobled it. Another triumph of personality is revealed in the history of Lord Northcliffe. In a few years he rose from the rank of working

journalists and became what he is to-day—perhaps the greatest newspaper proprietor in the world. His achievement is all the more remarkable when one remembers how little time was taken to accomplish it. He is only a man of fifty to-day. One might cite dozens of similar instances in every walk of life. The point to record is that wherever you find a dramatic rise of new leaders, there you will find men of a dominant habit of mind, and unusual physical strength.

Personality coupled with efficiency must succeed, and often does succeed conspicuously. In business life there are men who study personality even in appointing the humblest subordinate. The great leader of men has not an exclusive monopoly of personality. The personal note has its place in the smallest affairs of life, and personality spells advancement when it is at work at the bottom rung of the ladder. Only a few weeks ago the world smiled over an advertisement put out by a firm wanting travellers. There is nothing very amusing about a firm desiring travellers, but there was something essentially human in the demand they made for stout men. Interviewed by the press, the originators of the advertisement stated they employed many travellers and in their experience stout, prosperous, and good-tempered looking men produced more business than thinner workers on the same field. When one remembers how the fat man is frequently the butt of the world's humour, the demand for stout travellers would seem to be carrying an appreciation of the effect of personality to extremes. But the attitude of that firm is by no means so absurd as it seems to be at first sight. They are probably in a position to judge exactly what type of personality carries weight in their market, and since their returns prove that stout travellers secure more business than thin ones, they are justified in using this effect of personality in selecting all new men who join the outside staff. Through

this appreciation of the personal factor many business successes are made. The man who has much personality and leads in founding a big business is usually the man who attracts many personalities about him. He knows the value of strong personality and sees his staff possess it from the office boys to the heads of departments. Where personality is studied in business there you will find, all things being equal, that traces of character and individuality in the applicants for appointments determine the selection of the successful candidates.

Naturally, men who get on in life see the value of personality early in their careers, and try to analyse a force counting for so much. One well known business man landed in London from Australia with hardly enough money to tide him over a week. He immediately began a search for employment and met with nothing but rebuffs. Finally the stranger hit up against an advertising agency where he received the usual cold douche in the shape of a definite turn-down. The situation had by this time become desperate. He had to find work and income or starve. He turned to the man in control of the department who was administering the turn-down for the fifth time that day, and asked if there was any task in the office which the staff had failed to accomplish. In so many words he invited the manager to give him the most difficult task in the office and to test his right to a place, by his power of carrying out the work others had failed to do. By a strange coincidence this advertising agency had been trying to let advertising in a handbook, and advertisers had fought distinctly shy of giving orders. Although the printing date was overdue few advertisers had supported the venture. Every canvasser in the office had been tried on the task and had failed. The manager jumped at the sporting offer of the caller, turned the particulars of the handbook over to him, and told the visitor to return with sufficient orders to fill the publication. In

three days he came back with the necessary orders. The commission he drew was a liberal salary in itself. The advertising agency took the new-comer on the staff. In twelve months he was partner in the undertaking and his success in a larger field has carried him to the highest rung of the ladder. He is certainly an illustration of a man who deliberately uses his personality, and his faith in himself has been justified by the results.

Employers who attach importance to personality can be found by the hundred. One employer tests new applicants by their power to sit upright in a chair. If they slouch during the interview they are never engaged no matter what credentials they possess. Another employer simply asks each applicant what he would do under a certain set of unfamiliar circumstances. He does not expect an inspired answer to every question. The value of the test is its capacity to reveal the man who will pit his mind at any problem off the beaten track. Personality reveals itself in answer to advertisements offering situations. A familiar test among employers is to state specifically what they need and to refuse an interview to all who do not give exactly the information for which they are asked. It is a curious sidelight on the prevailing confusion of ideas in most minds that of a hundred applications to an advertisement asking applicants to state age, previous experience, and qualifications, fully 80 per cent of those who reply withheld some part of the necessary information. Personality reveals itself to the employer in carriage, address, and even in such small matters as the performance of details of the toilet. One employer I know boasts that he never takes into his service a man who obviously does not trouble to manicure his hands. Employers of great personality seem always to be looking for personality. As a final extreme example worthy of ranking with the demand for fat men, I might cite the newspaper editor who

would never dream of starting a reporter who had not a long nose. In his advertisements he always put the significant phrase, "Wanted a reporter with a nose for news," and when the period of interviewing came round the phrase was not a symbolical expression. The successful applicant had actually to have the nose itself, and a good sized one at that.

Personality perhaps counts more amongst the men who have to go direct to the customer and obtain support in the form of orders. It is a great test of a man's personal effect on other men to set him any task performed by the traveller or the canvasser. Amongst canvassers there are men who can be turned down by the office boy. There are others who have the knack of getting to the departmental managers but have not the ability to state clearly the advantages of the proposals they make. There are other men who get directly into touch with the heads of departments, and put up effective selling talk, and yet just miss carrying conviction. And there is a rare race of men who through the magic of great personality, march into offices almost as if they were ambassadors, who deign to see no one but principals and rarely make a business acquaintance without securing an order. The man who fails, speaking of the man who succeeds, says he gets his business by a combination of luck and impudence. These things, however, are not accidental and when a man gets business consistently, it may be taken for granted that he is not achieving his end either by luck or impudence, but has brought to bear upon his task a battery of important personal qualifications.

One of the most successful canvassers I know started life with a good education. Whatever he sets out to sell he studies as few travellers ever do. There is no point in his talk at which he is unarmed. Impossible to ask him a question about his goods without receiving an answer capable of

strengthening the case for a sale. To these routine abilities of a traveller our friend has added other personal qualities. In a moment of intimacy he told me that he enrolled at a leading academy and took the training young people undergo when preparing for the stage. He learnt not only to talk correctly but with the force one gets from a highly sympathetic actor. He learnt the value of facial expression and deportment, as well as perfect elocution—arts seldom studied by people who are not going on the stage. He claims this unusual course of study which may be considered a foolish preparation, for the business routine of a traveller has been of marked advantage to him at every stage of his career. Certainly in addition to his ability to put his case clearly, through close study of the possibilities of his proposition, he has developed a personality with such obvious attractions that almost every business call he makes is the beginning of a personal friendship. Business men are not only impressed by his directness; they are charmed by his personal address. Such a man is the first to admit that in business one of the first main essentials is personality. He goes further by making a preparation capable of allowing him to exploit his business knowledge by the charm of his manner and address.

It is notified for general information that by a notification, dated the 13th April 1918, the Government of India have prohibited the export of mineral lubricating oils to all destinations. The prohibition will, for the present, only be applied to imported oils, and Collectors of Customs have been instructed to license the export of indigenous products of this nature.

WHY MEN FAIL—A STUDY.

BY JAMES M. GLOVER.

TO explain the problem of why men fail is almost as impossible as to point out the reason why other men succeed. There being no such thing as luck (I am depending on many worthy philosophers here) success must occur owing to the right man being in the right place at the right moment (or not!) or at least so one would think! This, in itself would give any one a triple crown of correctness which would enable him to go far—the farther the better.

I used to believe in copy-book headings, and assimilated the succinct apothegms therein contained. Here was the path to success, plainly laid down—and dusty to boot. "A stitch in time," etc.,—we all know them, those boresome shavings from the tree of knowledge. I only knew personally, one individual who acted upon those copy-book headings, and his favourite was "Early to bed, early to rise, makes a man healthy, wealthy, and wise." He is now a time-keeper at a factory starting at 4 A.M.

Nevertheless, this "puts me off" copy-book headings and one is drawn farther to find the reason why men fail. I have often thought that in the scheme of nature it has been ordained that a man shall fail—gloriously or ingloriously—that his fellows may watch, and watching, take warning thereby! But no! Believe me. In the theatrical firmament the very next impossible musical comedy that happens along will find its speculative backer, will lose its allotted sovereigns, and go the way of all such "brilliant successes." So the "awful example" explanation won't do.

After all is said and done "failure" is an arbitrary and comparative word. An original old gentleman has recently died, Mr. W. H. C. Nation, a failure (theatrically) in the public eye if ever one lived. But to see the

hoary old man sitting in the wings at each performance, laboriously thumping and booming applause at his own wretched songs (what time not a six pence was in the house) was to appreciate the fact that "in the lexicon of age there's no such word as fail." And at any rate this miserable financier never neglected to pay out. As I say, failure is a mere matter of opinion. We have the story of Bizet—after the first reception of his "Carmen"—saying with tears in his voice that he did think he had made a success *this* time. Any one knows that "Carmen" has not failed.

Again, it must be conceded that a world full of "enormous successes," or their enormous successors, would be hardly tolerable. It is no good me after my "terrific" first night success going to Jenkins (a fellow producer) to tell him all about it, because it is only too certain that he also did, will, or means to do something far—far better! And even Press notices will not convince him, because he simply says, "Ah! you're well-known to the Press!" So that if one could only do a real failure, just for once, it would be quite good to walk the world listening for every one to tell you just exactly how you failed (and all different).

I have not the slightest doubt that in some future (improved) world when everybody, nearly, has learned exactly how not to fail there will be a peculiarly jolly life for the one "failure." He'll be able to sit and chuckle at the stories of the enormously successful, and have a good time generally, while they are wrangling over their "circulations" or "seating capacities." There are few things deadlier than great geniuses in conclave, but if you watch them carefully they do not "conclave." They keep very quiet. It shows dignity; also it prevents being bowled out.

There is no royal road to failure, some achieve failure, some have it thrust upon them. If one were to believe the copy-book staccato remarks, it's easy enough. (I wish

I could "answer back" to a copy-book.) "Whatsoever you find to do, do it with all your might." Very well! I knew an ardent perspiratory student of the drama, when he was a super—but quite a nice chap. He left to take a small part elsewhere. I occupied a box one night, and he (with a metropolitan engagement in view) on perceiving myself became actuated with fervent zeal. He rushed on to the stage to say his one line, fell into the orchestra, was promptly sacked—and there's your failure!

It must always be remembered that failure is not necessarily labelled, it wants discovering much in the same way as success. It may very well be that failure in a certain direction is merely meant to drive a man out of a wrong groove into one more fitted to his capabilities. It is a soothing thought and I present it with pleasure to many politicians and bigger public men. Not that I "go in" for politics. We "bar" polemics of all descriptions at the theatre. They "fail" to attract!

In very many cases "failure" is merely an explanation of being before one's time. The "Times" was before its day, once upon a time, and certainly achieved "failure" when it produced the first halfpenny morning paper (now forgotten, even by press men) "The Summary." This neat little journal provided one with a boiled down version of the (then) threepenny thunderer. An admirable idea, doomed to failure. Yet out of its basic notion has sprung first "The Morning," then the "Daily Mail"—and, I believe, "there are others." So that now, when Lord Northcliffe has taken over "The Times" with his customary push, it seems, somehow, according to the fitness of things.

It is obvious that the reason why men fail is because they have omitted to think of the obvious. While wearisome sages are thinking on the question of perpetual motion, somebody else invents the

"perforating machine," whereby you can tear stamps, cheques, receipts, etc., apart, and by this simple device earns an ample reward. I forget the name of this gentleman, but I know he "did better than," shall we say, Archimedes.

Failure cannot be judged until the flight of time has proved the event. Doubtless Blackmore thought "Lorna Doone" a "failure"—wonderful novel as it is—and he was not far wrong, until the marriage of the Marquis of Lorne established a connection in the public mind between the two entirely different happenings. The public bought "Lorna" on the strength of Lorne, and, by sheer accident, brought fame and fortune to the great author. That is why "Lorna Doone" did not "fail," quite apart of course, from its own charm.

In a general summary failure in most walks of life is due primarily to an absence of preconceived determination in one sense, and an absence of pluck in another. Half the schemes of men in early life "Gang aft agley" because the simple plan of the architect is not resorted to. The man who starts to build a house with bricks and mortar, without his architect's plan, as a basic proposition is doomed to failure, and a jerry-built, unreliable proposition. The man likewise who starts on the railroad of life without some fixed goal in view, with pluck and determination to carry it through, ends equally disastrously.

Half the great successes in commercial life are achieved by men who use no greater note-book than a half sheet of note-paper on which they note down their daily routine. They make up their mind to carry out a certain day's work, or week's work, or year's work, and so know where they are, all the time. Apply it how you may the principle is the same. The routine must be applied to your daily work, your daily food, your daily finance.

THE WASTE OF LIFE.

BY DR. C. W. SALEEBY, M.D., F.R.S.E., etc.

SOME optic atrophy assails us, so that, while life is spilled and wasted on every side, we merely deplore the fall of the birth-rate. This is not reasonable, nor even human, for as I showed at the Royal Institution five years ago, the birth-rate has been falling since the dawn of life, and in the main line of life's ascent. The highest birth-rate is among the microbes; the highest in vertebrates is among the fishes, who are the humblest vertebrates; the highest in mammals is among the rats and the rabbits; the lowest in mammals (with the exception of the huge elephant) is among ourselves; and as for birds, Darwin pointed out long ago that the fulmar petrel lays only one egg, but it is the most numerous bird in the world. As for man, whose birth-rate is so small, and in whom the birth-rate steadily falls as he advances, he is the only living creature who steadily increases in numbers.

The obvious explanation of this paradox of the petrel and of man, is that, though the young of these most numerous creatures be so few, they are the best cared for. So many of them are saved that the effective birth-rate, as I wish to call it, is indeed highest among ourselves. The fish may produce a million eggs in a season, but, on the average, all but two will die, and the numbers of the race will merely be maintained.

All this clearly means, in a word, that, as life ascends, its wastage diminishes. To produce three offspring, and save them all, is more economical, more human, more humane, more vital in the long run, than to produce a million and lose all but two. It follows that the wastage of life among ourselves is essentially inhuman, belonging to stages of life's ascent which we have really

outgrown; and it follows, further, that the movement of our age against the waste of life is in every sense, biological and moral too, in harmony with the genius of our species. In short, our first duty, as human and moral beings, is not to deplore the falling birth-rate, after the fashion of too many truculent moralists, who draw their confident indictments against a nation, but to save the birth-rate we have,—and then, perchance, humbly to “ask for more,” if we honestly believe ourselves capable of taking care of it.

Of course there is waste of life at all ages, among the mature and the prosperous, the men who have “retired,” and who spoil and abbreviate the holidays of their lives because they have no resort but eating and drinking, as also among the enthusiasts and the conscientious, who work themselves into their graves. All this is theme enough for long and useful discussion, but I must attend to first things first. Among all forms of life, death and destruction bear most heavily upon the immature. What Darwin taught us to call “natural selection” is chiefly a “slaughter of the innocents.” The death-rate, which is the waste-rate, is highest at the beginning of life, falls gradually away, and is never so high again until we observe it among the very old, where it can no longer be called waste of life at all.

This is strictly and abundantly true of ourselves. It is infancy and childhood that contribute so hugely to our death-rate, as ever since life began; and the further and complementary statement to that already made about the fall of the birth-rate as life ascends is that it has been accompanied by a fall in the death-rate. We, therefore, who work towards that end, towards preventing the waste of life in our day and generation, are working exactly in line with the main upward trend of organic progress.

The primary appointed means for the prevention of waste, in all the higher forms of life, are mothers and fathers—mothers

earliest and most, but fathers also. This we see alike in the oak's care of the developing acorn, the whale's care of her calf, swimming beside her, or that association of mother and child among ourselves which so many religious, surely not quite in error, have regarded as divine. First, then, if we are to prevent the waste of human life, we must take care of the mothers who primarily produce and take care of it. The existing infant mortality is approximately the measure of the need; and nothing can be more significant than the lessons we have learnt in the campaign of the last decade for the prevention of waste in infant life. The French, who have a tiny birth-rate, and who fear the Germans, with their huge (though rapidly falling) birth-rate, were naturally the pioneers. Where babies are scarce, they are precious. The pioneers invented the crèche, and the sterilised milk dépôt. They thought to short circuit the mother, and improve upon Nature's most ancient invention for the prevention of waste in infant life. Then they learnt to do better. They began to take care of the nursing mother; and now they have their reward. The Germans came very late into the field and made their experiments quickly, with the French examples before them. Already they have abandoned everything else and are beginning with the care of motherhood. That is the principle of what is, by universal consent, much the best thing in the Insurance Act, the “maternity benefit” which I heard impartially applauded from both sides of the House on the introduction of the Bill in May 1911. I repeat the suggestion that our national memorial to Lord Lister should take the form of a Listerian Order of skilled men and women, appointed by the nation to save and rescue its motherhood, in its creative hour, by the application of the great principles of Listerism. A nation that can afford public-houses and race-courses can afford to build a memorial to Lister, the greatest saviour of

life whom these islands ever bred, by thus calling him in as consultant to all its cases of maternity.

That would—nay, it will—be the first step; and then we must prepare to teach our adolescents and instruct our young parents, so that their love of their children may be fortified by knowledge. So long as individuals are mortal, the destiny of any people must hang upon its parenthood; or, as King George has said, “The foundations of national glory are set in the homes of the people.” Is it not time that we taught our girls to be good wives, even if we have to teach them less about the wives of Henry the Eighth?

We *must* lay the foundations aright, if we would successfully build the House of Life; I offer no apology for lingering there. But though our infant mortality (almost the whole of which is really national infanticide) still consumes, within the first year of life, more than one-tenth of all that are born, and though no subsequent wastage can equal this, Heaven knows there is enough. For soon we put the child upon cow's milk, and that is the beginning of tuberculosis which we now perceive to be, in reality, a disease of early life, like most other infections. All who really care about the waste of life are therefore bound to support the Pure Milk Bill which the hygienists have been demanding of Parliament for so many years.

The revelations derived from recruits in the Boer War led to a Royal Commission and Committees which examined our school children, and thence to “medical inspection.” Medical and dental treatment must follow. I say must, advisedly, for we are all agreed upon the principle of national insurance, and the burden thereof, steadily increasing year by year, would surely break the nation's back ere long, unless we saw to it, as we must, that the beginning of vital decay and waste, threatening in childhood, are arrested, so that the insurable population, at sixteen, starts healthy and can then with relative

ease and economy be left so.

The only rival to the infant mortality, which more than decimates our national life, is the tuberculosis mortality, above all from consumption, which also more than decimates us; and here, be it noted, the waste is very largely among young people, and young parents of both sexes. This is ruinous to the essential process by which alone a nation renews its youth; its present monetary cost is enormous; and we are now all beginning to ask, in the name of the Prevention of Waste, the question which the late King Edward, then Prince of Wales, asked seventeen years ago, “If preventable, why not prevented?” It will shortly be prevented; the Committee of experts now sitting on the subject, and the magnificent monetary provision lately made by Parliament, will see to that.

The nineteenth century amazed itself, and surpassed, in a few decades, the sum of all past achievement, in the mechanical realm. The physical, chemical and electrical sciences gave man such control over the external world as he had never dreamed of; and there were also produced Pasteur and Lister. What the nineteenth century did for the conditions of life the twentieth will do for life itself, first by prevention of vital waste, as those pioneers taught us, and then by sheer creation; but that is divine Eugenics or Race-Culture, and my space is exhausted. It has all coming time, and can afford to wait.

Ontario's timber production last year valued at 26,774,937 or 40 per cent of Canada's total output.

Pine production.	905,442,000 ft. B. M.
Pulpwood.	246,282 cords.
Railway, ties.	5,704,459.

Ontario's wood-working industries, using thirty-four kinds of wood, provide a ready market for the lumberman. Eighty-two per cent of lumber used in Ontario's Industries is purchased within the Province.

WORK AT PUSA, 1916-1917.

BY "RUSTICUS."

THE writer of a review for a monthly journal of such a publication as the "Scientific Reports of the Agricultural Research Institute, Pusa", who has not a printer's devil always at his elbow clamouring for copy, has certain advantages over his confrère, the contributor to the daily press. Not one of the least of these is that he can study the criticisms which have appeared in the daily papers and draw from them material for, at any rate, an opening for his own article. One of the charges which the present writer has seen not infrequently levelled against the Annual Reports on the work at Pusa is that they are much too technical. It is urged that they should be made more "popular", though what exactly is meant by "popular", is not explained. It was, presumably, to meet this criticism that the word "scientific" has been inserted in the title of the Annual Reports for the first time this year. This concession to somewhat uninformed opinion has not entirely mollified the critics. We can well imagine the average journalist finding himself taken aback on opening the book and being confronted by a sentence such as the following:—"The method proposed by Ajon of estimating potassium volumetrically by precipitating as bitartrate and subsequently titrating with alkali was found to give unreliable results, the error being about two per cent, the perchlorate method, as modified by Davis, still remaining the most convenient and accurate method."

This criticism—to which we have devoted some space as it has been made in papers which should have known better—appears to us to overlook the essential fact, that it is practically impossible to give the results of the work at Pusa in a form in which it

can all be easily understood by the layman. It is work carried out by men, each of whom is an expert in his own particular department, and experts have a language of their own. Why then publish it at all, says the critic, still unappeased. Certainly one danger of publication is that those parts of the Reports are ceased on which are the easiest reading and that some of the work done at Pusa is apt, on that account, to get a more extensive advertisement than it deserves whereas other work that may be sounder but is not so showy passes unnoticed. But we are always told that the true scientist cares nothing for advertisement and, if this is so, no one else need worry. In any case, it is desirable that a place where so much good work is done as at Pusa, should receive advertisement in whatever form. But the principal argument for publication is that there is, after all, much in the Reports which is of interest and value to all agriculturists, even if their scientific training has been of the smallest. We have no hesitation in saying that it would be a great pity if the Reports ceased to be available to the general public. Take, for example, the first section, the Report of the Imperial Agriculturist. From this, any large landholder can get some idea of how far it pays to work a large general farm in the unirrigated tracts of India on modern lines, *i. e.*, with proper rotations, proper cultivation, suitable manures and up-to-date machinery. For irrigated tracts, Mr. Henderson points out that a similar area on one of the large irrigation canals would be necessary. The arable area of the Pusa farm is about 400 acres and Mr. Henderson's figures show that the cost of working the farm during 1916-17 was Rs. 19,100, and the value of the return Rs. 28 per acre. But no estimate for rents, rates and taxes is included in these figures nor is interest on capital. It would make the Report more complete and valuable if figures under these heads were given in future years. As regards supervision, it

may be noted that Mr. Henderson quite legitimately, writes off the salaries of the higher posts against experimental work. The account he gives of the cattle breeding at Pusa is especially interesting. The herd cost about Rs. 5,000 to maintain last year but this amount, small as it is in proportion to the importance of the work done, will probably sensibly decrease in future years as it is proposed to have a public cattle auction sale at least once a year to dispose of all surplus stock. The best milking performance during the year was that of a cow, Imani by name, which gave a total yield of 6,200 lbs.

Pusa suffered a severe loss during the year owing to the untimely death of Mr. J. H. Barnes, the Imperial Agricultural Chemist, to whose memory a well deserved tribute was recently paid by Mr. MacKenna, the Agricultural Adviser, at the meeting of the Board of Agriculture at Poona. The work of his section, temporarily in charge of Mr. Davis, the Indigo Research Chemist, is of such a highly technical character that it is impossible to attempt a description of it. Much useful work was done on the analysis of soils but perhaps the work of most general interest was that which is being done on starch. The great difficulty which has stood in the way of the manufacture on a large scale of starch from sweet potatoes has been that the potato crop is only available for some two or three months in the year and that, even if two crops of potatoes were grown, the manufacturing plant would still be lying idle for the greater part of the year. It has now been found that there is another root crop in Bihar, known as *suthni*, which is also very suitable for the manufacture of starch and comes on the market at a different time of year. If this is utilized as well as the sweet potato, starch can be manufactured continuously from November when the harvest of *suthni* begins to the end of March when the first crop of sweet potato, which becomes avail-

able about the end of January, would have been utilized. In July and August, a second crop of sweet potatoes could be obtained. A sample of starch manufactured from sweet potato was very favourably reported on by the well known manufacturers Messrs. Reckitt and Sons of Hull, who thought it probable that it would fetch about £20 per ton.

Dr. Butler, the Imperial Mycologist and his staff, continued as usual, the investigation and the demonstration of methods of control of plant diseases. The work of this section is as difficult as that of any at Pusa and progress is slow. No remedy has yet been discovered for the *ufra* disease of paddy, to which reference has frequently been made in these columns, beyond burning the stubble and ploughing early, a method of treatment by no means effective in all cases, especially in swampy land. Information was, however, obtained in regard to the habits of the eelworm which causes *ufra* and this may be of great assistance later on in the discovery of the most effective means of dealing with it. It has now been conclusively established that the worm cannot migrate to reach the upper parts of the rice plant where alone it can feed, in dry air, but does so readily when the humidity of the air approaches saturation point even though there is no film of free water on the plants. Amongst other diseases investigated by the Mycological Section were the root rot of cotton, a serious pest in parts of Northern and Western India, the *tikka* disease of groundnut, the common potato blight and the *sal* tree disease. A definite remedy against peach leaf curl, a cause of serious loss in the important fruit growing districts of North West India, has now been found in spraying with Burgundy mixture.

Mr. Fletcher, the Imperial Entomologist, gives a most interesting account of the work of his own section and that of the section which deals with pathological entomology, of which he was also in charge during the

year. In the entomological section proper, more than two hundred different lots of insects reared and observations made on their life history. In the other section, Mr. Howlett's work on the attraction exercised on flesh flies and other insects by dead animal matter in different stages of putrefaction was continued. The account Mr. Fletcher gives of the habits of these unpleasant creatures makes very good reading and furnishes plenty of evidence that Dean Swift, to whom is commonly attributed the authorship of the old jingle

" Big fleas have little fleas
Upon their backs to bite'em
And little fleas have lesser fleas
And, so on, ad infinitum "

was in possession of a valuable scientific truth.

The most important investigations carried out in the Agricultural Bacteriological section were perhaps those on the organisms in soils, which produce the nitrogen so necessary to plant growth, and on the pebrine disease of silk-worms. In addition to these, Mr. Hutchinson collaborated with Mr. Davis in work on indigo. One of the reasons why synthetic indigo had, in pre-war days, almost brought about the total extinction of the natural product was the failure in factory practice to obtain a near approximation to the theoretic yield of the indigo from the plant. The two chief reasons for this were the destruction of indican in the leaf during fermentation or steeping and incomplete extraction of the indican. The investigations of Messrs. Hutchinson and Davis are therefore being directed to controlling the fermentation taking place in the steeping vats by introducing conditions which will minimize these losses. The lines of enquiry which are being adopted, aim at determining the possibility of increasing the yield of indigo by introducing specific bacteria into the steeping vats and the best way of doing this on a field scale and under factory conditions.

Mr. Hutchinson is of opinion that the second part of his enquiry will be the more difficult of solution. It is obviously even more important than the first for, even if the yield of indigo is increased, there is no hope of a permanent revival of the indigo industry unless the methods of extraction of the increased yield proves a commercial proposition.

The work of the Botanical section at Pusa differs from that of the other sections in that it has become almost as much commercial as scientific. Mr. and Mrs. Howard seem to have solved satisfactorily the question of fruit packing in Baluchistan and the great Indian towns may now look forward with some confidence to securing a supply of excellent fruit from that Province. A new and interesting development of their work has been the sun drying of vegetables for the Army in Mesopotamia. A large number of vegetables, both European and Indian, were successfully dried, the cooked product in nearly every case being almost indistinguishable from the fresh. Dried vegetables are, however, very bulky and the question of storing and transporting the produce had therefore to be considered. The problem was solved by steaming the vegetables and pressing them into bricks, each one pound in weight and of such a size that they could be packed into kerosene tins which could then be soldered. This process reduced the space taken up by the vegetables to about one-seventh. Packed in this way, Mr. Howard states that it is possible to compress the weekly supplies of vegetables for a battalion on active service into twelve kerosene tins which can be transported by two mules. It will be interesting to hear the opinion of the troops in Mesopotamia of the process and to know whether the vegetables lose any thing in flavour in the process of steaming and pressing. If they do not, Mr. and Mrs. Howard will have rendered a service of incalculable value, for the supply of fresh vegetables is of the utmost

importance in keeping an army healthy and was until recently, an acute problem in Mesopotamia. Mr. and Mrs. Howard's investigations in the saving of irrigation water in the Punjab should also have important results. Their experiments have shewn that wheat can be successfully grown on preliminary irrigation only without assistance from the winter rainfall and that better crops can be grown on two waterings than on the four usually given by the cultivator. Here again, if it is established that the water is saved when it is really required elsewhere and would not, in any case, be running "somewhere safe to sea," Mr. and Mrs. Howard's work should have a far reaching effect. As for the rest, the work of the Economic Botanists on wheat, tobacco, fibres and indigo continued much on the lines we have mentioned in previous reviews of the Pusa Report. Pusa No. 12 wheat continued to increase in popularity and the demand for seed was much greater than the supply. As a considerable portion of the profits from the Government wheat scheme is being devoted to the extension of seed farms, this difficulty is in a fair way to be overcome. Work on wheat is by no means yet completed and two crosses derived from Pusa No. 6, which combine strong rooting and standing power with rust resistance, yield and high grain quality are reported to be very promising.

In view of the recent tour of the Indian Cotton Committee throughout India, the section of the Report contributed by Mr. Gammie, the Imperial Cotton Specialist is, this year, of special interest. Mr. Gammie, in commenting on the work of the Bombay Agricultural Department in Khandesh in spreading the short staple *roseum* does well to emphasize the indications which are setting in of a more insistent demand for finer cottons and the desirability that the Department should be prepared to put out a higher class of cotton when the demand for it reaches that tract. He points out the risk

of a great fall in the price of *roseum* on account of overproduction. He does not consider that Cambodia will ever become popular in the Southern Mahratta Country as its success varies so considerably with the character of the season and thinks that the proper line of development for this tract lies in work on *kumpta* cotton, the ginning percentage of which has already been raised 4 per cent by selection. He comments on the deterioration of the well known Broach cotton, owing to the steadily increasing proportion of the short staple *Goghari* cotton in it, but is unable to suggest a remedy. In the Central Provinces, he speaks hopefully of the cross between *bani*, i. e., Hinganghat cotton and *deshi* Lahore known as the *Sindewahi* cross, and of Cambodia in the lateritic soils of Raipur. In the Western part of the Provinces, the cotton growing tracts proper, he appears to consider that the lavish distribution of *roseum* to the exclusion of all other varieties has been justified by the financial results obtained. His report furnishes additional evidence, if any be required, of the great complexity of the problems which await solution by the Cotton Committee.

The scarcity of rubber has apparently been got over in some way in Germany by the production of substitutes, which seem to be very suitable for certain purposes. According to a German paper, a good deal of attention is being paid at the moment to various forms of animal plant and mineral substance for the manufacture of tyres. In place of rubber, flax and hemp are being used. These are soaked in rubber paraffin wax, or celluloid. Tyres are also made of a series of layers of calico steeped in rubber, or of strips of leather specially treated. In place of plant fibres, mineral substances are also in use. For instance, asbestos, which is mixed at a certain heat with balata rubber. It is also stated that air tubes for tyres are being made in Switzerland from Japanese Silk paper soaked in a form of wax.

THE MADRAS FORESTS,

1916-17.

BY A. P. SMITH,
DEPUTY CONSERVATOR OF FORESTS,
TRAVANCORE (RETD.)

IT is an extremely interesting, if rather disappointing administration report for 1916-17 covered by Government Order No. 166 dated 10th January, 1918, of the Government of Madras: interesting because of the great possibilities in the development of the forests which a study of the report affords a glimpse and disappointing because of the comparatively little progress that has been made in that connection during the year owing primarily to the lack of competent men and secondarily to the inadequacy of funds. In ordinary circumstances a sufficiency of money would assure the supply of competent men. At the worst, only some delay in securing men would arise; but owing to the war, not only are competent men not available, but the Forest Department has been deprived of the services of some of its capable officers in the cause of military service.

As usual the Administration Report contains the separate reports of the four circles, into which the forest areas in the Presidency have been divided, in a combined form—a vast improvement on the entirely separate report system in vogue up to last year. The Proceedings of the Board of Revenue on the Report and the extremely brief review of the Government are apart in the report. From the last we learn that the Government have recognised that a special Forest Settlement Officer is desirable if settlement work in Salem is to be completed at an early date. Owing to the paucity of officers none is available for the work and the appointment is in abeyance. Settlement work in the Central and Western Circles is practically completed, but in the Northern and Southern

Circles it lags and the Collectors concerned have been required to submit to the Board a half-yearly return of progress. Besides a promised special Settlement Officer, and, pending the development of a Forest Engineering Staff the Government purpose deputing an experienced forest officer to study, in Canada, the most modern methods of timber extraction and transport, with a view to their application to the problems of this Presidency. Of course, the application of modern methods means a considerable expenditure on machinery and lines of communication, but it is a step in the right direction for Indian methods of felling, moving timber, etc., are yet in a very primitive condition. The information that the Secretary of State has sanctioned the appointment of a Chief Conservator of Forests—a new creation in this Presidency—and the addition of nine other posts to the Imperial and ten to the Provincial cadres, will be welcomed by the Department which, for its relative importance and earning possibilities, is undermanned and not overgenerously supplied with money for development. The chief conservatorship and the additions necessarily hang on funds being available. The proposals for the reorganization of the subordinate staff are “under consideration,” a phrase that may mean it may be for years or it may be for ever, or prompt despatch. That prompt despatch is desirable may be gleaned from the Conservator’s remarks. He urges the imperative necessity of reorganizing the whole controlling, executive, protective and clerical establishments of the department, and he quotes the very trenchant remarks of the Hon’ble Mr. W. O. Horne, Commissioner of Forests in 1912. Mr. Horne said then that since 1907 things had gone from bad to worse inasmuch as it was impossible to continue to acquiesce in a state of inefficiency. He pointed out Rangers’ charges were too large negating good work and for this Rangers could not be fairly

blamed, that guards were so sparsely distributed, that protection of the forests was impossible and responsibility could not be enforced, that vacancies arising from leave, deputation, suspensions, training, etc., could not be filled, and, in short, "that the work of the department was kept in a constant state of struggling inefficiency", with the result that current work fell into arrears, working plans were not worked up to, and progress was impossible. Mr. E. A. Davis, I.C.S., Collector of Guntur, writing on the work in that district said the forests were badly equipped for exploitation and markets had yet to be opened up, while expenditure on communications and buildings was wholly inadequate. As regards forest accounts, Mr. Davis wrote:—"Revenue includes indiscriminately such items as receipts on account of trees in darkhast lands and tapping fees, over which the department has little or no control, and also such items as the proceeds of the sale of disforested lands, which item comprises both capital expenditure recouped and revenue, deferred and current. Expenditure includes that on both capital and revenue accounts. It will never be possible to gauge the financial results of the actual working in a given area until the system of accounting is revised so as to show separately receipts and expenditure on capital and revenue account, and also to divide revenue derived from the working of the department from that originating in adventitious outside sources." This is valuable criticism.

When the appointment of the Chief Conservator becomes an accomplished fact it seems desirable that he should find a seat on the Legislative Council. It is true the Commissioner of Forests in the Revenue Board is on the Legislative Council, and although an I. C. S. officer is credited with an amount of omniscience not generally thought to be the qualification of lesser men, it is excusable to suppose that the Chief Conservator would be in a better position to represent the needs of the department unhampered

by considerations which are likely to handicap the Commissioner as Member of the Board of Revenue.

The total area of reserved forests at the end of the year was 18,810 square miles, and of reserved lands 725 square miles, a tract by no means excessive for the Presidency. From the tabular statements of Forest offences, the number of offences was less than in the preceding year and less also than the average for the preceding three years, and the decrease is attributed to better supervision, to the satisfactory working of the patrol system and to the working and extension of forest panchayats, and the kancha system. The offences under this last are left to the kanchadars to deal with. They nevertheless ought to be brought under the heading of forest crime. The forest panchayats increased from 147 to 290—a big jump—the area under their management increasing from 210 to 479 square miles. The desirability of giving a legal status to the panchayat is under contemplation and the Board will submit with the administration report for 1916-17, a report on the forest panchayats and their working.

There is no need to traverse the parts of the report relating to working plans and demarcation, surveys, plan of operations, communications, etc. It is necessary, however, to note that no satisfactory progress in the preparation and working of working plans is possible with hopelessly inadequate staff. Fire protection appears to have been particularly successful as only about 135 square miles altogether were overrun by fire. Not only was the season favourable, but penal measures such as closing areas to grazing, the refusal for the free removal of grass and the resulting co-operation of villagers to assist in putting out fires and the labours of hill tribes all contributed to success. Some questions were asked in the Legislative Council some two or three years ago relating to excessive compounding fees being demanded

by forest officers empowered to deal with offences and further enquiry resulted in a Government Order sanctioning the observance of definite procedure and prohibiting District Forest Officers passing orders to confiscate the seized property when compounding an offence, and these rules "were generally observed." The main causes for fires were for entering the forests by crossing the exterior fire lines, intentional firing to obtain new and fresh grass for cattle grazing and fires maliciously caused. The origin of a good many fires could not be traced and would perhaps fall under the three main causes mentioned. The maliciously caused fires, it is to be feared, arose from bad blood between the subordinates of the Forest Department and villagers. It is quite conceivable that an unscrupulous guard would not hesitate to set fire to a forest himself in order to revenge himself for some insult or wrong done to him by a cattle owner, the village munsiff or some villagers living near a reserve. It is noted that a guard was rewarded for discovering a felled teak tree. Rewards in such cases should be very carefully looked into. We have in mind a case in which a guard frequently salvaged teak timber in this way and got great kudos for his zeal. It was discovered later that he systematically got trees felled, had them concealed in a pond or river, and subsequently, in connivance with the elephant mahout dragged the trees to light and reported the salvage.

The most interesting parts of the report refer to research and natural and artificial reproduction. The efforts made to propagate sandal, the experiments taken in hand concerning spike disease, lac culture, etc., are to be greatly commended. A curious *contre temps* arising from the similarity of names of railway stations occurred with regard to an attempt to experiment in lac. Broad lac from Maihar was wrongly despatched by some careless railway official, to Karnal in Northern India instead of to Kurnool

in the south; and by the time the error was rectified the broad had swarmed. Another broad was obtained at the end of the year and is in its experimental stage. The trees which are to be tried are the *Butea frondosa* and the *Zizyhpus xylopyra*. Both these trees are to be found in deciduous forests and are common in Travancore. From the *Butea frondosa* lac has been obtained for many years in other parts of India. Experiments are in progress to ascertain if sal (*Shorea robusta*) can be used for cask staves. It may be mentioned that another tree, the *Polgalthia longifolia*, is very common in South India. It is a good avenue tree and the timber is tough and elastic and bends very easily and should be useful for the purpose for which experiments are being made with sal. Among other trees which yield suitable timber of the kind required and which should be abundant in the Western Circle are the *Miliusa velutina* and the *Bocaged dalzelli*, the leaves of the last containing an appreciable percentage of tannin. A good deal of work is being carried out by sowing seeds of different kinds of trees at places where they are not found and a fair amount of success has resulted. Special efforts are being made with sandal. Girdling has been tried with sandal trees with very unpromising results apparently, for we read that the white sap wood between the bark and heartwood assumes a greyish appearance and is scentless. The tree dies very slowly after girdling, and takes nearly three years to perish. The only advantage arising from girdling appears to be that the heartwood is more free from cracks than in the case where the wood is taken from a dying tree, but even then the heartwood is not free from cracks. The girdling of a tree in some way dissipates the essential oil in teak. In Burma teak trees are girdled and the timber is often flawless. In Travacore the tree is invariably felled and the timber is often marred by cracks, though not always,

the felling producing the disappearance of the valuable essential oil in the timber which preserves the wood from early decay. Perhaps, in sandal felling would be preferable to girdling.

There appears to be some scepticism as to whether the sandal tree is an obligate root-parasite, and from some plants specially put down in South Vellore the trees have not yet exhibited any weakness. No other weeds or plants are allowed near the trees. The ultimate result will be interesting, but hardly conclusive without further trials. When Mr. Vernede was Conservator of Forests in Travancore, a sandal plantation was tried about six miles from Quilon—in which town the sandal grows luxuriantly. The plantation was very carefully weeded and the trees grew luxuriantly at first, but in a few years died out for no apparent cause. The parasitism of the plant had not then been recognised. That the sandal is a root parasite there is plenty of evidence, but it may be that given certain conditions it may grow without that auxiliary aid. Nothing will be lost by the experiment. Experiments of sorts are in progress in connection with spike disease and though no definite information has as yet been obtained it would seem that in the near future the origin of the disease will be determined. Mr. Hearsay leans to the opinion that spike is closely associated with sucking insects among others the Red Spider, *Monophlebus*, two species of *Icerya* and *Psyllidæ*. Dr. Coleman has demonstrated that the disease is communicable by grafting and that spike is not confined to the sandal tree. This has been confirmed by Mr. Hearsay's experiments. The experiments connected with the thinning of bamboo clumps, the regeneration of evergreen forests, the destruction of creeper growths, the thinnings of coppice shoots, the raising of sandal from root-sucker, etc., are all forest work proper and much valuable knowledge is being recorded.

From a commercial point of view nothing of special significance is reported. The research work in hand will most certainly develop in that direction, especially after the war, when there will be a demand for many products such as tanners' dyes, essential oils, soft wood for matches, etc. Just now, as stated before, the department is undermanned and without the expert advice necessary for the best results to be obtained. The more one studies these Annual Reports the more convinced one is that the Controlling Staff is efficient and zealous and that it only needs a liberal expenditure to make the Indian forests an abiding source of wealth to the country. The Indian villager is an opponent of scientific conservation of the forests, but even that slow moving individual, by reason of his co-operation through the forest panchayats, is beginning to realize that if the forests were destroyed agricultural operations would suffer and fodder for cattle would have to be raised from the exhausted lands, which now give but poor returns in crops for his own subsistence. It seems to me that more educative work could be done by the department through the agency of the panchayats. Where the panchayats are not operative, leaflets in the vernacular in support of scientific forestry and showing the important part that forests play in a country should be distributed. The vernacular newspapers would, perhaps, co-operate in increasing knowledge in forest matters, if properly approached. The co-operation of the people in every department of administration is of the very greatest importance.

The Belgo-Canadian Pulp and Paper Company, Limited, of Shawenegan Falls, Quebec, has decided to commence planting trees on its holdings, making the third large paper company to undertake such reforestation work.

CO-ORDINATION OF ECONOMIC ACTIVITIES IN THE STATE.

BY S. SRINIVASA MURTI, B.A.

SINCE the inauguration of the Economic Conference in 1911, systematic attention has been paid to the development of economic activities in the State, as a result of which several local bodies such as the District, Taluk Progress and Village Improvement Committees have been brought into being so as to form a chain connecting the highest with the lowest. The Conference not being even a decade old yet, it has got an air of novelty to the people who stand in wonder and bewilderment at its varied activities and methods. As it generally happens with all new undertakings, it has got its sympathisers and critics among the educated classes, and friends and critics apart, it must be confessed that the Conference has many things to learn as well as to unlearn as it is passing more or less through an experimental stage in the political life of the State.

One of the striking features of the Conference is the bewildering array of subjects brought forward for discussion. While this serves to keep the mind of the members active on economic subjects, it does not enable them to focus attention upon any of them for a considerable length of time. What is gained in variety is lost in depth. To arrive at a practical decision on any subject, much patient study of local conditions, collection of statistics, consultation of expert advice, comparison of result obtained in places outside the Province are often required. As the Conference is purely a deliberative assembly*, there is no harm in its pre-occupation with a multiplicity of

questions, provided they are considered carefully, with reference to local conditions and not hurried through to some conclusion. It must be said to the credit of the Conference that it has been so very active that it has hatched out a number of schemes the successful execution of which will bring a higher measure of prosperity to the State.

While the Central Committees should remain deliberative bodies for the investigation of schemes till the stage of practical action is reached, the deliberative character need not attach to District, Taluk and Village Improvement Committees which should be organized more or less for practical action. Unfortunately these bodies have followed the example of the Central Committees and assemble to discuss subjects and to say aye or nay rather than to compare results of work done by each of the members composing them. The weakness of the Conference seems to lie in this—that it has allowed deliberation to outrun execution and practical action. Execution must necessarily be slow owing to financial considerations as an unlimited number of agencies cannot be employed. But finances apart, it is possible to secure better results by co-ordinating the work of existing agencies and bringing about mutual understanding among them.

As a preliminary step, I would have only one committee for one village capable of dealing with all affairs pertaining to it, instead of having several committees for different purposes. For instance, in a decently populated and thriving village the following committees are at present to be found:—The Village Improvement Committee, the Village Panchayat, the Village Tank Panchayat, the Union Panchayat, the Forest Panchayat, the Temple Committee (*Dharmadersies*), the Library Committee, and the School Committee. In a highly organized community with

* This is not strictly correct.—Ed. M.E.J.

a keen sense of corporate life such division of powers and functions is legitimate, as each member of it knows his exact place in it and realises his responsibility to do his share of the work in a wholehearted manner. But in a community not yet awakened to self-consciousness as most of our village communities are, such devolution of functions may not lead to any great results. The old traditions still rule the mind of people, and as the new institutions are not the outgrowth of these old traditions, they appear to be engrafted upon them from outside. Hence the feeble response that is met with from the people, however zealous the Government is to bring about reform among them. In all social progress there are two important factors—the individual and the environment and both of them act and react upon each other. The education of the individual and change in environment should go hand in hand. Applying this principle to the conditions of village life, it must be admitted that as education has hardly made any progress, an elaborate scheme of social progress for villages is quite uncalled for. The establishment of numerous committees with sub-division of functions implies the existence of a complex social structure in the village and of individuals to sustain its weight. But unfortunately this is not the case as everybody who has anything to do with the village can certify. Hence, I would suggest the merging of all the committees into one strong committee composed of influential inhabitants and village officers and capable of executing all measures of reform in the interest of the village as a whole.

After the establishment of a competent single committee, the next thing to do is the laying down of a definite programme. Indeed, there has been prepared a development programme for the next five years in each Taluk, but as it has not been carefully prepared upon any definite data, it may not serve any useful purpose. Moreover the

actual programme of work drawn up for each year in the Taluk bears no relation to the five-year development programme and the work turned out is so very meagre that it strikes one as if no definite ends are aimed at and no programme is followed. The poor result may be accounted by the principle that in trying to grasp everything we grasp nothing. The development form contains so many items of work that it is not possible to pay equal attention to all. A fair amount of success is likely to be achieved if careful thought is bestowed in drawing up the programme and in selection of the right sort of persons to carry it through. Only as much work as it is possible to do should be included in the annual programme and regular stock-taking should be held at the Taluk Conference which should be a miniature Representative Assembly for the Taluk. In drawing up the future programme, the Taluk Conference should be consulted both as regards the urgency of the wants, major and minor, of the Taluk to be taken up and the extent of help which the Conference is prepared to give in the matter of the satisfaction of those wants. The way in which business is transacted at the Taluk Conference now leaves very much to be desired.

Concentration of effort on a few items of work is rendered impossible by the number of subjects to which attention is directed to be paid. The multiplicity of subjects is due to the deliberative character of the Assemblies now working. The list of subjects is swelled when the executive heads of Departments go out on tour and receive representations from the people. But it is one thing to know the wants of the people and quite another to take steps for their satisfaction. If an end is to be realised, it should be pursued with dogged determination and if energy is not to be dissipated, it should be concentrated on a few practicable ends. This is the secret of success which he who runs may read.

To organize for practical action, it is very necessary that the District and Taluk Progress Committees should be converted into executive bodies. They may indeed be allowed to bring forward new subjects which may be recorded in the suggestion book, but they should not be taken up for practical action thereby departing from the programme for the year, unless they are capable of being immediately given effect to. The work definitely settled for the year should be distributed among both official and non-official members and they should be held responsible for doing their share of the work. It is very necessary that several Economic Assistants should be appointed for each Taluk to associate with non-official gentlemen to give practical effect to schemes taken up for operation. The District Committee should co-ordinate the work of the Taluks allotting funds and taking up such subjects as are common to several Taluks. The Taluk programmes should be printed and sent to all heads of Departments and they should be held severally responsible for the completion of their share of the work allotted in them. The present method of transferring schemes matured by the Economic Conference to the Taluk Amildar for execution has not led to appreciable results. The Amildar has neither the time nor the agency to carry them into effect. Suppose the item of work included in a Taluk programme is the establishment of well-equipped schools in all villages containing a population of 1,000. Such villages in a Taluk may number ten or fifteen. For executing this item of work, the various Village Committee members should be associated with select Taluk Progress Committee members, the Assistant Deputy Inspector of Education, the Hobli Shekdar, and the Economic Assistants. The District Inspector of Education should be charged with the duty of watching the progress made in the execution of work and stimulating it should it be found to be slack. The aid of the Taluk Amildar should

be sought where any villagers are found to be recalcitrant and not amenable to reason. In the same way other items of work may be taken in hand for execution.

As statistics is the handmaid of all economic progress the establishment of a statistical Bureau is imperatively called for. The value of statistics is indeed recognised, but no attempt is made to secure figures with a fair approach to accuracy. The figures contained in the Hand-books published may be challenged, because at present there are no means of collecting statistics and they are based upon surmises. The opening of a statistical department will obviate the necessity of preparing statistics to order and place economic progress on a sound basis. If Economic Assistants are appointed for each Taluk, they may not only be engaged in directing economic activities, but may be employed for collecting statistics with as little margin of error as possible. The scientific handling of statistics is an art in which a few graduates may well be deputed to undergo training.

The co-ordination of work in the Departments of Agriculture, Education and Industries will leave very little work for the Representative Assembly to do. As economic life constitutes at present three-fourths of the life of the people, the Economic Conference may be expected to deal nearly with all subjects pertaining to their welfare. As the Conference work becomes well organized the Representative Assembly may lose its power and prestige; but if it be re-constituted it can still fulfil some useful function. The Economic Conference does not possess the representative character which the Dasara Assembly has and all questions where a referendum is called for may well be referred to it. The Representative Assembly need not bring in local subjects, as the Taluk Conference is the proper place for them.

The disease from which our people are suffering is more psychological than physical. The mass of inertia, ignorance, and

prejudice upon which unceasing war has to be waged is colossal. The habit of going to Government offices with petitions on the part of the people should be discouraged and instead the quality of self-reliance should be developed in them. That Government single-handed can do everything for them is one of the delusions under which people now work and this is due to their long subjection to autocratic methods of rule. The progress of education, it is hoped, will open their eyes to these facts, for there is no lever more potent to raise a people to a higher level than education. We may establish more institutions on the western model, bring about vast changes in the environment, but unless we, at the same time, try to transform the individual, and change his mental outlook, all the reforms will be tinkling cymbal and sounding brass.

I have put together these reflections in the hope that they may awaken thought in the minds of those interested in the economic welfare of the State. As the subject is one capable of being handled from different standpoints, I invite a frank and free criticism of my views, especially from the District Economic Superintendents, one of whose duties is to study all such questions and offer suggestions to Government.

Of late there has been a good deal of criticism of the Bank of England, much of it amateurish and of no weight, some of it inspired by political and financial jealousy. Nevertheless the London Chamber of Commerce has appointed a special Committee on the recommendation of the financial section of the Chamber to "examine and report upon the constitution and functions of the Bank of England". It is regarded as likely that suggestions with a view to modernising and strengthening the bank as a national institution, will emanate from the investigation. Whether or not the Bank officials will prove amenable to reform remains to be seen.

INDIAN FINANCE AND COMMERCE.

Sugar Farming In Assam.

Calcutta, 16th April, 1918.—Not the least successful efforts to establish sugar growth and manufacture in this country on profitable lines must be credited to Assam. In continuation of the information given some months ago in these columns regarding the experiments initiated and controlled by the agricultural experts of the province, we learn from the report of the Agricultural Department, Assam, for the year ending 30th June, 1917, that during the year under report, work at the Kamrup Sugar Farm made much progress though for various reasons many difficulties were met with in regard to the manufacturing side. The area reclaimed and under cultivation at the close of the year was 650 acres in all, of which some 500 acres are now under cane, plant and ratoon. The soil of the farm is a good loam and fertile and very suitable for sugarcane. The annual rainfall being high, though well distributed, demands a light free draining soil such as exists here. The system of drainage adopted in the previous year having proved very efficient was extended to the new area and worked quite satisfactorily. The water table has been considerably lowered and surface accumulations even after heaviest falls of rain are now things of the past. Planting of the new cane began in the middle of February and was finished by the end of March. The varieties cultivated were Striped Mauritius, Barbadoes 147 and 376, but the prospects of the crop are not so favourable as they were at this time in the previous year owing to drought after planting.

The crop of 1916 was a good one, the average outturn being estimated at twenty tons per acre. The ripening season was perfect and the canes matured their juice properly. The Agricultural Chemist made analyses of

the crop at various periods. The plant canes of all three varieties were found very rich in sucrose, averaging about 15 per cent on cane when ripe. During the year the question of handling the crop arose and a contract was made with Mr. W. Maxwell, who erected a *gur* factory on the farm to deal with the canes. Cane was supplied to him on a sliding scale based on the sucrose content and the price obtained for the *gur*. Owing to unavoidable delay in the arrival of machinery and plant and climatic and other difficulties, crushing did not commence till the middle of February. After a little time the manufacture of *gur* on a large scale with open evaporators was found to be impracticable. Some 775 tons of cane were dealt with in the factory, the remainder of the crop being thrown away or distributed for setts, some 225,000 cuttings being sent out for sale or demonstration purposes. It is only fair to Mr. Maxwell to say that it was largely due to delay in completion of the contract that more could not be accomplished this year. The *gur* factory is now being converted into a white sugar factory on modern lines, and it is intended to convert the crop now on the ground direct into white sugar next cold weather; but considerable difficulties are being experienced in the procuring of machinery.

COMMERCE AND STATE.

Allusion is made periodically to "Indian Commercial Opinion" upon economic problems—based upon the tacit assumption that such opinion is sufficiently organized and focussed to admit of accurate representation through the existing half-dozen or dozen Indian Chambers of Commerce. To acknowledge, however, that such bodies are thoroughly representative would be to foster an illusion. Indigenous commercial opinion is, indeed, as difficult to ascertain as indigenous political opinion. This statement cannot be disputed. Then there arises the question: by what means can the indigenous commercial community be organized for

purposes political and commercial? Isolated Chambers of Commerce, of uncertain membership, with varying constitutions and management, cannot be regarded as an entirely adequate or acceptable form of organization.

In France, as is well-known, commercial organizations are semi-official. The recent report on Indo-French trade, for example, says:—

"The various Chambers of Commerce are however the most prominent organizations connected with commerce. They are in a sense semi-official bodies, their mode of election of members, the number of members, the scope of their powers, and even the official precedence of their Presidents and members being fixed by special laws—notably those of 1898 and 1908. Many of the Chambers, however, date from years much anterior to these, as for instance that at Marseilles which has had an almost unbroken history from its foundation in 1599. Every merchant or business-man in France has to pay an annual 'patent' or license fee, practically a profession tax, which confers on him certain privileges, one of them being that of voting at the Chamber elections, or of being elected a member of the Chamber. The sanctioned number of seats in a Chamber are distributed among the different local interests, according to their relative importance as determined from time to time by a Committee presided over by the Prefect or chief State Official of the locality. A member when elected holds his seat for six years. In France, therefore, the term 'Member of the Chamber of Commerce' means a member of the general managing committee or council."

"There is at least one Chamber for every Department and 154 in all in France. That of Marseilles deals not only with the town of Marseilles, but also with the eastern half of the Département of the Bouches au Rhone. Its electors or patentees number 36,000. On certain matters of commercial importance the various State Departments are bound to

consult the Chambers, whilst on others, the Chambers can address the Central Departments. The Chambers may own and administer property. At Marseilles the Bourse belongs to the Chamber, it also administers and controls the greater part of the port and is responsible for the work of extension already in hand costing some 91 million francs of, which it has assumed liability to the extent of $42\frac{1}{8}$ millions. Another instance of the work of a Chamber in this time of war is found in connection with the lack of small coinage. There has been a shortage of 'change' in France as in many other countries. The difficulty has been overcome by authorising the various Chambers within their own circles to issue one franc and fifty centime notes against security deposited with the Bank of France. These are current only within the jurisdiction of the local Chamber—a point which a traveller has to notice rather carefully—and have a fixed term of currency generally from five to seven years.

"The funds of a Chamber are obtained from dues, rents, payments for public services rendered, investments, and by the levy of so many centimes in the franc on the licence, or patent, on the electors in the circle."

This is a point the Industrial Commission might take up. It is late in the day to argue the advantages of commercial organization. The Industrial ambitions now in evidence would, we believe, be considerably advantaged were commercial organization more complete. It has to be admitted that indigenous businessmen are not yet as closely organized as might be desired and it is logical to infer that they will eventually act only under official stimulus. The French system in our view, invites consideration. The advantages of such an organization would, we consider, be commercial, administrative, and political—political, because organization would ensure adequate representation of commercial interests on political bodies; administrative, because organization

would facilitate enforcement of various laws and regulations, and otherwise smooth politico-economic relations; and commercial, because organization conduces to sound methods of industry and trade.

COAL SUPPLIES.

In its report for 1917 the Punjab Chamber of Commerce, comments on State collieries as below:—

In January the Committee addressed the Government of India with regard to the disorganization of trade resulting from the inability of the Railways of Northern and Western India to maintain their transit facilities to the public for the want of coal. It was pointed out to Government that all the Railways of India, with the exception of the East Indian Railway, rely for their coal supply on the organization and enterprise of the Colliery Companies, and that it was the failure of the Collieries to supply coal that had brought about the trouble. To remedy the evil your Committee took the opportunity of reiterating the views expressed in 1913, to the effect that it was in favour of a policy of acquisition of coal fields and their development by Indian Railways themselves.

To this representation the Government of India replied that it was the avowed policy of Government to allow Railways, both State and Company managed, to acquire Collieries and raise coal for their own consumption. It was further stated that the policy in question had been acted upon in the past, and proposals for its more extended application were under the consideration of Government.

ADULTERATION OF PRODUCE.

Commercial opinion in the Punjab, as represented by the Chamber of Commerce, concerning adulteration of produce, is that the proper agency for dealing with complaints is the trade itself. The Chamber has consequently recommended Government to approach the representative bodies of the merchants who handle the various articles

of produce abroad, such as:—The International Federation of Master Cotton Spinners; The Dundee Chamber of Commerce acting for their Jute Mills; The London Chamber of Commerce acting for Leather Merchants; The London Hemp Associations; The Imperial Institute acting for the Indian Beeswax Importers; The Representative Body of the Oil-seeds Crushing Industry; The Representative Body of Indigo Importers; The Representative Body of the Rice Milling Industry; with a suggestion that an effort should be made by them to draft and establish forms of contract suitable for the various articles of produce in which their merchants deal and fix standards of quality and of purity as has been done with such marked success by the Corn Trade Association of the United Kingdom in their Wheat Contract. In the Wheat Trade the system of survey is in operation at the port of discharge and is accepted as a condition of the business. The method for the settlement of disputes of whatsoever nature in connection with quality, purity, etc., is simple and effective. Samples are drawn from bulk in the presence of representatives of the seller and buyer which are submitted to experts in the trade for survey. The awards of surveyors are, in all cases, final.

The Chamber see no reason why this system should not be applied to all the various descriptions of produce to which it is not now applied as soon as fixed standards for purity, etc., are definitely laid down in accepted forms of contract. Contract forms which have been accepted by the trade for which they have been drafted should be given the widest publicity possible in India so that all who handle produce, from the Zemindar down, may know the terms and conditions on which it is marked abroad. By this means, it is believed, it will gradually come to be understood that it does not pay to adulterate.

DUX.

ECONOMICS IN THE WEST.

Development of Steel Production.

London, 8th January, 1918.—As the war proceeds the vital importance of supplies of metal to a country is emphasised. The successive orders issued by our Government controlling and restricting the disposal of metals for private purposes illustrates the great extent of our needs. As to Germany we have long known the desperate shifts to which she is driven to provide the absolutely essential material for the manufacture of munitions. For example, in to-day's paper I read that the great bell of Cologne Cathedral is about to be taken down and melted for war purposes. The fact is that the expenditure of ammunition on both sides is colossal and ordinary supplies go very little way towards feeding the voracious maws of the thousands of factories which up and down the country are turning out war material. Stimulated by the war demand there has been a remarkable development of steel production in Great Britain, and as you know, also in India during the war. Figures showing the rate of progress made in the home sphere have before been given in these notes, but I may, perhaps, be excused for reproducing the latest returns which appear in the January issue of the *Times Trade Supplement* as they are most striking. "Prior to the war," the writer informs us, "we produced in Great Britain between 7,000,000 and 8,000,000 tons annually of which about 5,000,000 tons were worked up into various forms and products for export. We are now approaching an output of 12,000,000 tons a year. When current extensions are complete we shall be able to produce about 14,000,000 tons of steel annually." In effect, therefore, the steel production will have doubled during the war. This is a remarkable fact and one which cannot fail to have a great and lasting

influence on British trade; for these steel factories which are now turning out material for lethal purposes after the war will be devoted to supplying the world's urgent needs for steel work for the reconstruction of its peaceful life for railways, bridges, and buildings of the reinforced type. British enterprise will not be worthy of the same if it does not take the fullest advantage of the openings that will offer. Our manufacturers have had their lesson and we shall not see the steel trade slip back into the old rut in which before the war it was embedded with imminent danger of being left hopelessly behind by foreign rivals.

India's partnership in this future expansion of the steel trade is assured: Her magnificent resources are bound to secure her a handsome share of the trade that will spring up after the war. At present home staying people here do not yet fully realise this. They still picture India as a lotus eating land in which the old practice of shaking the pagoda tree has largely fallen into desuetude owing to a diminution of productive power. For this reason I am glad to learn that the Society of Arts is making a special feature this month of a paper on "The Tata Steel and Iron Works" which is to be read by Mr. H. M. Surtees Tuckwell, M. I. Mech. E., whose qualifications for the task of explaining the character of this greatest of Indian industrial enterprises are well known in India. The facts which will be placed before the audience over which Lord Sydenham is to preside will, I think, be a revelation to the public. They will inevitably stimulate interest in the Indian industrial situation, the importance of which was in danger of being overlooked owing to the prominence which political issues have been given by Mr. Montagu's mission and the attendant discussions.

LOCAL SUPPLY OF OIL.

Next to steel production the most important feature of the industrial developments of the time is the measures that are being

taken to create a local supply of oil. In this as in other matters an enormous stimulus has been given by the exigencies of the war. We are never told—and rightly so—exactly how many million gallons are required by our fighting forces afloat and ashore, but we know that the figure is colossal—so enormous, in fact, to make the problem of maintaining an adequate supply of petroleum one of real and serious difficulty. Nor is the conclusion of peace likely altogether to remove anxiety since the demands of industry on a peace basis are likely to be as large if not larger than those of the services on a war footing. For example, the use of motor tractors for ploughing is now a common feature of the countryside and after the war there will unquestionably be a gigantic multiplication of motor agencies for agricultural work. Realising all this the authorities have for some time past been engaged in conducting investigations into the possibilities of oil production in the home land. As far as the scientific part of the inquiry is concerned much progress has been made. Mr. H. Cunningham Craig, Technical Assistant to Sir Boverton Redwood, the eminent scientist, speaking on the subject the other day said, "I am satisfied that a large new industry can be started in this country and worked profitably even in peace time. Both petrol and fuel oil could be produced in fairly large quantities." Another well known authority confirmed the opinion that at least 100,000,000 gallons of oil a year can be produced by developing our home resources. "This possibility," he said, "has been well known to geologists and others for a considerable time.... There are two methods of obtaining oil from bituminous material—the high temperature and the low temperature process. By the first named system the minimum amount of oil and the maximum amount of ammonium sulphate is obtained. The low temperature process produces the maximum amount of oil. The high temperature

process is in vogue in Scotland, and the vested interests therein are very great and influential. The general adoption of the low temperature process by the Government would be a serious blow to those financially interested in the high temperature process. "Unfortunately owing it may be surmised to this clash of interests nothing has as yet been done by the Government to give practical effect to the conclusions of the experts. However, the matter is now being strongly agitated and we may pretty safely assume that in a not distant future machinery will be set up for the serious exploitation of the process of extracting oil from bituminous material.

FISH SUPPLIES.

From oil to fish is a somewhat sudden transition, but I cannot help calling attention here to a rather notable letter which has just appeared in the *Times* relative to the possibility of making fish supplies more generally available for the population. Of course the writer's views are written exclusively with an eye to the home population, but I think they may be given a wider application. At all events they deserve to be carefully studied in India where more bountiful supplies of fish exist than almost anywhere in the world and yet where fresh fish excepting at places near the coast is eaten only by a comparatively small portion of the population. The writers of the letter, (Mr. J. Stanley Gardiner, F. R. S., Professor of Zoology, Cambridge, and Mr. Gurge H. F. Mittall, F. R. S., Quick Professor of Biology, Cambridge), point out that in normal times owing to the glut of fish in the market at particular periods of the year a considerable proportion of the total catch of herrings has to be exported while in other circumstances the surplus might be used to supplement the food of the people. The cheapest and best method of preserving fish, they go on to say, is freezing. Two methods of freezing may be employed—(a) dry freezing, and (b) freezing in brine. In the former

the fish are simply frozen in the air of a cold chamber at some temperature below 25° F.; the time required properly to freeze a herring is at least twelve hours, and the resulting product shows a market loss in weight and flavour, the flesh further becoming pulpy with loss of juice in thawing. In brine freezing the fish are plunged into a bath of ordinary salt brine at a temperature below 16° F., a fish being completely frozen through in two hours. The pipes by which the chamber is cooled can be passed through the brine bath, which is open to the air, or, experimentally, the whole process can be carried out as we have done it, by using an ice and salt freezing mixture in a large tub. By the brine freezing process, ten to twelve relays of fish can be frozen in the same bath in twenty-four hours. The fish when removed can be simply packed in barrels, which can stand, as we have proved, for months in a cold storage chamber at 28° to 32° F. The herrings when thawed out gradually in cold water, are practically in the same condition as when first placed in the brine. At such low temperatures no salt penetrates their tissues. There is no appreciable loss in weight or in flavour; the muscle cells do not break up in any way, and hence there is no pulping of the fish nor loss of juice." Beyond doubt great possibilities are opened up by the method of preserving fish indicated by these well known Cambridge professors. At the moment in the neighbourhood in which I reside five pence is paid for a single herring. Preserve the catches at the fishing ports and the price would be reduced probably five hundred fold. The same reasoning applies to India. Safeguard your wonderful supplies and distribute them in cold storage over the land and a substantial means of supplementing the food supplies of a large section of the population will have been secured.

MINERAL EXPLOITATION IN INDIA.

Interested reference is being made here to the plans which the Government of India

have formed for the better exploitation of the mineral resources of India. If Sir Alfred Robbins, the well known London correspondent of the *Birmingham Post* is correctly informed arrangements are being made by which greater facilities will be given to *bona fide* and competent prospectors whether individuals or companies. "The present firm of exploring license assumes that the applicant knows little or nothing about the mineral resources of the area applied for except in a general way. It is often impossible for him at the outset to define any particular area such as is required to comply with the standard form of license. On the other hand his activity and outlay entitle him to some protection if successful. The *bona fide* inspection is always liable now to be deprived of the fruits of his labours by others following in his tracks and taking advantage of his investigations. To remedy this and encourage prospectors it is intended to grant exploring and prospecting licenses over limited areas, coupled with a guarantee of mining licenses ultimately on production of proof of reasonable success. This policy is to be extended to the Native States, the mineral resources of which are as yet hardly touched." The new departure sketched is an important one and wisely directed it is calculated markedly to hasten the complete economic rehabilitation of India. But if care is not taken the system may be utilised by the speculator to India's disadvantage. In every instance the Government should have a fair share of the production either in the shape of a royalty or in some other effective way. Where the right arrangement is made there is no reason to fear mineral exploitation. On the contrary it may be welcomed as an inestimable boon to a hitherto poor country.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Chemical Progress of America.

Washington, U.S.A., 14th January, 1918.—At a glance the chemical progress of the United States since the war began can be learned from the following outstanding facts. The country, due to the necessities brought about by the war, now manufactures practically everything along chemical lines, and is now exporting in a considerable amount some chemical products which it had to import prior to the war.

The increase in capital invested in chemical industries in the United States was, in 1915, \$65,565,000; in 1916, \$99,244,000; in 1917, \$164,000,000.

Before the war 90 per cent of the artificial colors and dyes were imported into the United States, five or six concerns with 400 operatives producing 3,300 short tons per year. Now there are over ninety enterprises, each making crudes and intermediates. This is considered a distinct industrial triumph for the United States.

Sulphuric acid, the chemical barometer, has doubled in production.

By-product coking more than doubled its capacity in the last three years.

Gasoline production has increased from 35,000,000 to 70,000,000 barrels per annum since 1914.

The production of explosives and consequent consumption of nitric acid has increased enormously. As is well known, the nitric acid is still almost entirely made from Chilean saltpetre, but synthetic nitrogen plants are under process of construction at this time.

Before the war 40,000 tons of barite were imported from Germany for the manufacture of lithopone. At this time there are six large companies producing this article in the southern states of the United States.

It has been stated by competent authorities that the industrial progress of the United States, especially in a chemical way, has made more progress in the past three years than is on record for the fifteen years preceding 1914.

FERRIS WHEEL FOR ASSEMBLING FORD AUTOMOBILES.

An industrial subject of general interest throughout the world is the great manufacturing plant of the Ford Automobile Company, in Detroit, Michigan. A feature of this mammoth establishment is a huge Ferris wheel which operates as a conveyor in the process of assembling turns over the cars at a certain stage of the work, elevates them to an upper story and sends them along that floor in a position which is the reverse of that at the start.

The real object of this device is to allow the mechanics to do the work on the under side of the machine without the necessity of getting under it, and thus it is possible to work with greater ease, and much more can be accomplished with less time and labour.

The unique conveyor referred to operates, in a general way, as follows:—

On the first floor of the factory the bare frame of the car is placed upside down on the conveyor and travels the length of that floor in this position. The operations at that stage include the placing on the machine of running board supports, mud pan and braces, springs and axles. Entering the spraying chamber the chassis receives the first coat of paint, and thence goes to the oven for baking. Then just before reaching the big wheel at the other end of the floor the wheels with the tires are attached.

At this point an electric motor-driven wheel takes hold of the chassis and carries it around an arc that elevates it through a hole in the floor above, and places it on a conveyor there, right side up. On the upper floor those parts are attached which can be handled conveniently from the top side. The

engine is set into place by an overhead crane; then come fenders, running board, steering wheel, etc., and finally, by means of an ingenious monorail system, located over head, the body of the automobile is added.

A CAR THAT MAKES A BUSINESS OF JUMPING THE TRACK.

An interurban railroad in the State of California has installed wheels on one of its cars with a solid-rubber-covered portion for ordinary road work and a flanged section alongside for use on the tracks. This car goes out to the farms that are located off the direct line, in some instances several miles from the track to go on its way cityward.

At present only freight is hauled in this novel fashion, but passenger busses capable of leaving the track at any crossing are being planned and it is expected that they will be put into operation within a short time. In quite the same way as the freight cars, these busses will call for passengers and drop them again at their destinations on the return trip.

The inventor, who is also the owner of the line on which the car above described is in operation, is at present working on a safety locking device to be operated from the driver's seat, which will securely fasten the front wheels and keep them on the track. At present they are locked before the car starts, and a stop is necessary before they can be unlocked to permit the car to leave the track.

TEN MILLION MORE HORSE POWER FROM NIAGARA FALLS.

Niagara Falls is commonly regarded as a scenic wonder only, but without the power of Niagara's falling waters this country should be fearfully handicapped in the grim task we have set ourselves of waging war. The public at large does not realize it, but our position at the forefront of the electro-chemical industry of the western hemisphere is due almost entirely to the energy furnished by the waters that rush from Lake Erie to Lake Ontario.

The power of the Niagara River developed at the falls has made it possible for us to produce upon a generous commercial scale metallurgical alloys indispensable to the production of steel fit for armor plate, high-power guns, armor-piercing projectiles, and the extremely exacting demands of the motors for flying machines.

Thanks to electro-chemistry, we are drawing from the air about Niagara Falls great volumes of atmospheric nitrogen and storing it or fixing it in forms that will help the farmer, the munition maker, the pharmaceutical chemist, our manufacturers of synthetic dyes, etc., all of them vitally helpful to us in equipping and maintaining our fighting fleet and our battling armies. It is there, too, that relatively cheap electrical energy is converting the simple materials of salt, sawdust and coke into crystals of carborundum—that wonderful abrasive that plays so big a part in the latest industrial processes.

According to the estimates of Government experts, it is physically possible to develop at Niagara Falls a maximum of 6,500,000 horse-power, but because of international agreement the legal maximum cannot exceed 790,000. As a matter of fact, because of various hampering circumstances, the total energy actually available for commercial service probably does not exceed 550,000 horse-power. The difference between fact and potentiality is the price paid for scenic beauty. The public generally, from time to time, has registered its vigorous protest against any impairment of this natural wonder. Engineers, therefore, have striven to find acceptable solutions of this economic problem, and among the latest is the "Thomsen-Porter Cataract Project." Additional hydro-electric energy has become an acute national necessity, and the engineering genius of the plan is satisfied that the scheme in question will make it possible to obtain the desired power without in any wise detracting from the charm of Niagara Falls.

The fundamental feature of the project is a massive dam rising from the rocky bed of the Niagara River and blocking the gorge from bank to bank at a point a little more than four miles below the famous cataract. By means of this dam the water level would be raised high enough above the present surface of the river to provide an effective head of ninety feet. The local result would be to lower the visible rise of the flanking cliffs by something like one-third.

FIBRE CONTAINERS AS A SUBSTITUTE FOR GLASS AND TIN.

The extensive use of fibre containers in marketing various food products has greatly increased because of the shortage of tin plate. The principal question raised concerns the kinds of products that can be successfully marketed in such containers. The United States Department of Commerce has been advised by a manufacturer that the following-named articles have been successfully handled by the users of its fibre containers: Syrups that do not ferment, jellies, jams, marmalades, honey, salted nuts, marshmallow products known under trade names such as marshmallow whip, mallow topping, and the like; marshmallows, hard candies, chocolate coated confections, sugar butter, malted milk, glace fruit, shoe whitening, cocoa, and almost every one of the commonly used spices. The following products may be packed in fibre containers for a short length of time: Cottage cheese and other soft curd cheeses, lard, pickled fish, sausage meat, horse-radish, sauer-kraut, ice cream, various delicatessen products and soda fountain supplies.

Another use for the fibre containers is as measures for dried products, such as crackers, small cakes, salted peanuts, salted and dry-cured fish of many varieties and most kinds of sweets and candies.

One concern has reported that it has an order for fibre containers to be used for holding a liquid chemical fire extinguisher.

MAKING CONCRETE TELL ITS STORY.

Under the applications of force, structures made by man undergo changes, alterations—they bend and sway, deform and twist, but the eye does not see. A bridge looks just the same with a heavy train on it or off it; a tall building stands apparently immovable in the heaviest wind storm; we do not even know when the earth itself moves as the result of a distant earthquake.

But the eyes of science know—the delicate gauges, the micrometers, the dainty indicating hands on meters of various sorts, tell engineers the story of structural material, and let him know, before he builds his tower, his bridge, or his modern pyramid of an office building, just how long, how wide, how thick, each part must be that the strains which will be put upon it be not greater than it can bear with safety.

But, say the engineers, we do not know it all yet. Consequently occasionally a bridge fails, a building tumbles, a span gives way. Yet research laboratories are constantly at work pushing further and further away the frontiers of our knowledge of structural material.

One of those research laboratories, at the Government experimental farm at Arlington, Virginia, has recently done some very interesting work in making concrete slabs tell their story to the engineer. The slab floors of small concrete culverts and bridges, the floors of factories where heavy machinery concentrates a load, and similar situations, all make it highly essential that the construction engineer know just how a slab or concrete, supported at two ends, acts when a load is applied to its centre.

It is obvious that if a slab be sixteen feet long, for instance, supported at its ends, and of infinite width, there is a portion of the slab on either side of the point of load which takes no part in supporting that load. Just how far do the stresses applied at one point extend? How much does the width of the concrete beam support and how much the

length, proportionate to each other? What is the "effective width" to be used, in percentage of the length, in formulæ for the calculation of slabs to support a given load?

These and kindred questions, many too abstruse for any but the structural engineer, are answered by constructing concrete slabs of known size, and then subjecting them to loads applied to one point, and the taking of careful measurements of deflections and deformations of the slabs under such loads. The results in diagrams of curves, showing the effects of pressure, and in mathematical formulæ, form an important addition to the literature of the subject, which those interested in its technical side can obtain from the United States Government.

MEASURING DISTANCES BY PRISMATIC BINOCULARS.

There are already in existence numerous ingenious instruments for measuring distances. Frequently, however, it is desirable to estimate a certain distance with a fair amount of accuracy and by the simplest means possible. This is not always an easy matter, especially in unfamiliar surroundings, and only after long practice will such estimates turn out comparatively accurate. An instrument which is of great assistance in judging distances is the prismatic form of binoculars when provided with a calibrated disc. These discs enhance the already many-sided utility of the prismatic binoculars, and offer the further advantage that they do not, in the slightest degree, interfere with the view when the binoculars are used for the purpose for which they were originally designed. The calibrated disc, as it is now manufactured in the United States, consists of a thin glass plate with the divisional lines marked on it, and is placed in the right-hand barrel. By means of this disc the distance to an object of known dimensions can be ascertained, or conversely, if the distance be known, the dimensions of the object may easily be found. The discs are now manufactured which are calibrated according to the purpose for which they are intended.

ALFRED T. MARKS.

NOTES.

The War Cabinet has sanctioned a new scheme for the supervision of commercial intelligence, and a memorandum describing the plan has been issued. The scheme, provides, *inter alia*, for the creation of an enlarged commercial intelligence department. Briefly put the scheme is as follows:—An enlarged Commercial Intelligence Department will be created on a scale adequate to meet the reasonable requirements of British trade after the war. Parliamentary control over the Department will be exercised through a new Parliamentary Secretary, who will occupy the position both of Additional Parliamentary Secretary at the Board of Trade, and also additional Parliamentary Under-Secretary for Foreign Affairs. This Parliamentary Secretary will be responsible to the President of the Board of Trade for all matters within the competence of that Department, and responsible to the Secretary of State for Foreign Affairs for all matters concerning the Foreign Office. By matters concerning the Foreign Office is meant all questions concerning the direction and organization of the Commercial Attaché and Consular Services and the commercial work of officers of these services, and of the Diplomatic Service, so far as these matters are not dealt with by the Consular or other departments of the Foreign Office, and also matters concerning the *personnel* of the Foreign Office and of the above services who may be temporarily attached to the Department, and any matters arising out of the work of the department involving questions of foreign policy. All instructions issued to Commercial Attachés or other Diplomatic or Consular Officers will be issued in the name of the Secretary of State for Foreign Affairs. On all other matters the responsibility will lie with the Board of Trade.

The Commercial Intelligence Department will eventually comprise the existing Depart-

ment of Commercial Intelligence of the Board of Trade and the Foreign Trade Department of the Foreign Office: and will take over such of the staff and records of the War Trade Intelligence and Statistical Departments as may be available and required. The official head of the department will be an officer appointed jointly by the President of the Board of Trade and the Secretary of State for Foreign Affairs, working under the new Parliamentary Secretary. The appointment and control of the Trade Commissioners within the Empire will, as at present, rest with the Board of Trade, and the appointment and control of the Commercial Attachés and Consular Service with the Foreign Office, but the work of the new department will comprise all matters dealing with commercial intelligence, and so far as is necessary for that purpose, it will give directions to the oversea services and make the necessary arrangements for keeping them in close touch with the commercial classes in this country.

There will be a constant interchange of staff between the department and both the Foreign Office and the Board of Trade, so that members of those departments may be thoroughly acquainted with the work. Opportunity will be given to diplomats and consuls in training to serve for a period in the department. It will also draw *personnel* from the Commercial Attaché and Consular Services, and from men of outside business experience. In the same way officers of the Trade Commissioner Service will be trained in the department and will be attached to it from time to time.

The Department will be assisted by an Advisory Committee of business men, and it is hoped that it will be possible to arrange for a sub-committee of this committee to meet at frequent intervals in order to advise the department on its current work. It is believed that these proposals afford a

satisfactory solution of a problem which for some years past has been urged on the attention of H. M. Government by the commercial and industrial community. Their criticisms have been especially directed against the duality of the existing systems under which, while the direction of the Commercial Attaché and Consular Services rests with the Foreign Office, the utilisation of the fruits of their commercial work lies with the Board of Trade. Under the new scheme the direction of the commercial work of the foreign services and the distribution of the intelligence collected by them will be dealt with by a single department, and as the same department will also direct the Trade Commissioner Service within the Empire, uniformity of policy will be secured in respect of overseas trade as a whole.

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The *Statist*, writing about American and Japanese influence in the economic development of the Dutch East Indies, calls prominent attention to a new factor in Java sugar trade. The importance of the Dutch colonies as a field of commercial enterprise has not been missed by our Eastern Ally—Japan, says our contemporary. The latest news is to the effect that a Japanese Company, with a capital of six million yen, is seeking to obtain a seventy-five years lease of some eight thousand acres of ground for the cultivation of sugar, and is intending to erect large refineries in Java. A Japanese Steamship Company, moreover, is about to start a new line of vessels running to Java, though already regular monthly sailings are made by a Japanese Company working under a subsidy of the Japanese Government. The installation of Japanese sugar refineries in Java and the Japanese exort at growing (their own sugar-cane on lands leased in Java) must have a profound effect upon the Indian sugar industry, says the *Tribune*. Even now, with the extinction of the imports of beet sugar from enemy countries, Japan has gained considerable ground in the Indian

sugar market. In 1913-14, we imported from Japan only 131 tons of sugar when imports from Java and Mauritius, amounted to 582,995 tons and 139,568 tons respectively. In 1915-16, imports from the last two countries decreased to 316,748 tons and 81,718 tons respectively, while the imports from Japan, instead of decreasing, increased to 704 tons. In 1915-16, the imports from Mauritius decreased further to 69,418 tons owing to diversion of the product to English Market; but imports from Java increased slightly to 415,017 tons, while imports from Japan jumped up to 11,507 tons. If Japan succeeds in obtaining a foothold in Java and competes with Dutch capitalists in the production of cheap sugar, Indian sugar manufacture must inevitably suffer. Earnest efforts are necessary to protest the nascent Indian industry from the joint competition of Japan and Java; and the temporary interests of the import traders must be made to yield to the permanent interests of the country. It is true, as the Director of Statistics, says, "serious attempts are being made to improve the cultivation of cane in India." The production of raw sugar in British India was estimated at 2,636,000 tons during 1915-16, showing an increase of 3 per cent in area and 7 per cent in yield as compared with 1914-15. The average yield per acre was also better, being 22 cwts., per acre against 19 cwts., the average of the preceding ten years. Bengal also produced 99,000 tons raw sugar from date and palmyra palm as against 96,000 tons in the preceding year. The increases are, however, too small and inadequate to withstand the stress of trade competition after the war. Doubtless the progress of research work at the cane breeding stations at Coimbatore and Shahjahanpur and in Bihar and the distribution of cuttings from selected canes to growers will have some beneficial effect. Perhaps Government will also be pleased to afford cheap transport facilities on railways

to Indian sugar producers in order to help them to withstand foreign competition. But ultimately we expect that some measure of fiscal protection will also be necessary till such time as new enterprises established themselves in the country. The Indian Chambers of Commerce ought to urge the question on the attention of Government with greater unanimity than before.

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The rapid industrial development which has been witnessed in Japan during the past three years is of direct interest and importance to India. From notes supplied by the British Vice-Consul at Tokio, it would appear that a very large number of new companies have been formed since the war began for the purpose of carrying on a variety of industries. The manufacture of chemicals in particular has undergone very great expansion, at least twenty companies with a combined capital of about £3 millions having been formed for the purpose of engaging in this field. These new enterprises operate 28 factories and turn out many products, including sulphate of ammonia, potassium chloride, nitric acid, glycerine, fertilisers, disinfectants and phosphorus. The iron and steel industries have also made marked progress and one steel company which is devoting itself to the export trade is supplying orders from India and China. Other new enterprises are devoting their energies to zinc, aluminium, machinery and electrical supplies and accessories. Six companies with an aggregate capital of £1,700,000 have been formed to carry on the production and refining of mineral oils, while sixteen concerns have been organized for the purpose of manufacturing textiles. This enumeration is by no means complete, but it gives a fair idea of the activity which prevails. Meanwhile Japanese firms are vigorously engaged in extending their trade in the Indian market, and the success which they have achieved was eloquently shown by the figures contained in Mr. Findlay Shirras's Review of the Trade of

India for 1916-17. The imports of Japanese beer into this country, for instance, rose from £1,000 in 1913-14 to £76,000 last year, of bangles from £1,000 to £243,000 of machinery and millwork from £10,000 to £89,000, of hardware from £41,000 to £333,000 and of woollen manufactures from £1,000 to £165,000. The most striking increase recorded, however, was in cotton piece-goods, which rose from a pre-war quinquennial average of £40,000 to £1,620,000. It is an interesting question as to whether this progress will continue when normal conditions return.

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There has been remarkable progress in mechanical cultivation in the Bombay Presidency this year, and the demand for agricultural machinery, it is asserted, has never been so large as now. Attempts to utilise agricultural motor-tractors have proved beyond dispute that there will be a good market for these machines. The Agricultural Department started recently the operation of steam-ploughs to work virgin land, and we learn that several concerns have lately been formed to import tractors to work on a co-operative basis. As the soil is heavy, the demand will be chiefly for powerful tractors. On all farms belonging to the Department of Agriculture improved implements can be bought or hired, and it has now a large number of depôts at which implements are kept for sale or hire, and spare parts are stocked. Each year the number of such depôts is increased. So many implements are now bought direct from dealers by agricultural associations, co-operative societies, and by individuals, that it is not possible to compute the number sold annually, but taking only a few of the places in the Bombay Presidency at which such implements are available, it is found that sales amounted to 69,100 rupees, and charges for hiring to 2,750 rupees in 1916. Instruction in engine driving is being given at the workshop of the College Farm of the

Department of Agriculture, and everything possible is being done to overcome the initial difficulties which must occur when inexperienced people take to the use of machinery.

It is not generally realised, says the *Pioneer*, what a marked effect the war has exercised on the Indian textile industries. Mr. A. H. Silver, Controller of Textile Supplies, Indian Munitions Board, states that, speaking generally, the whole of the requirements of the Army in cotton textiles is now supplied from Indian sources. Even dyes used in the production of khaki goods are obtained in increasing quantities in India, while requirements in the form of tape, webbing and white cotton rugs are largely drawn from hand weavers through the agency of provincial associations. Moreover, the entire capacity of the Indian woollen mills is engaged in Army work, and it is hoped that the output of these mills, supplemented by the products of hand-loom, will for the future suffice for all military requirements. The bulk of the blankets required for the Army is also supplied by hand-loom, and during the past six months about half-a-million blankets have been drawn from this source. Further, it has been found practicable to make a put too material in Kashmir dyed to a satisfactory khaki with indigenous products and Mr. Silver reports that a fairly extensive order has been given for the manufacture of this material. Another development is the substitution of jute canvas made in India for flax canvas formerly imported from abroad. Large quantities of canvas are required by the Army, and as the cost of the jute product is about one-third of that of flax canvas, considerable saving of expenditure has resulted from the change. It is to be hoped that the economic lessons taught by the war in regard to Indian products will not be forgotten when peace is restored.

The Salt and Abkari Department of Madras propose to manufacture table salt

and place a sufficient quantity in the market at a considerably lower price than is paid for the imported article. An account of this is given in the Madras Exhibition Catalogue and it shows that the average annual import by sea is about 3,500 maunds and the price has been trebled. It is possible to make in Madras salt closely resembling the imported table salt by a process similar to that employed in Cheshire. At the present time Madras table salt can be made for 1 anna 3 pies per pound as against 3 annas, the current price of imported salt. A comparative analysis of the two kinds of salt shows that, while the proportion of sodium chloride, calcium sulphate and sulphate of soda is nearly the same, the Madras table salt contains 1.14 per cent of magnesium sulphate and a smaller quantity of nitrate of potash which the imported salt does not contain. The process of manufacture is said to be very simple and all information can be had from the Inspector of Salt and Abkari Revenue, Madras. It is also said that Epsom Salts can be easily manufactured from sea-water and Mr. C. I. Barry has a small factory for this at Adirampatnam in Tanjore District.

India's cultivation and trade in oil-yielding seeds and nuts is likely to expand in an extraordinary manner after the War, says the *Indian Industries and Power*. Groundnuts and cotton-seeds take precedence because of increased cultivation during the last few years, but there are many others, including castor-seed, copra, linseed, mowha-seed, sesamum, poppy and the soya bean, which will have a great influence on the industrial activity of India. The great possibilities of cotton-seed are very well-known, but it is surprising to find only one mill working satisfactorily in India, with the adjustment of tariffs, the cheapening of freights, and State encouragement to Indian manufacturers after the War, this solitary

mill should quickly find itself surrounded with companies. Margarine-making will undoubtedly develop here with the expansion of the cotton-seed industry and be a serious competitor to the butter-making firms of Guzerat. India is realising fully the evil of exporting her oil-seeds to Europe when there is so much wealth to be extracted from them, and she too is taking notice of the waste going on in India in the crude consumption of two-thirds of her output for cooking and toilet purposes. It is computed that 65 per cent of the oil-seeds consumed locally is wasted because of our inability to scientifically extract and separate its wealth producing parts.

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The following is from the Review of the Progress Report of Forest Administration in the Punjab for the year ended June 30:—The resin industry is an excellent example of successful departmental enterprise. By the end of the year more than half a million blazes were being tapped, one-sixth being in Kangra where tapping has now been undertaken for the first time. The factory at Jallo worked continuously through the cold weather, and the plant gave complete satisfaction: the monthly output reached the creditable average of 4,000 maunds of resin, in addition to over 40,000 gallons of turpentine, and the quality has now been pronounced fit for the European market. At the same time the cessation of imports from abroad has greatly raised prices, and the year has therefore been financially most successful; the profit Rs. 1,31,524 more than covering the entire cost of the distillery. The Lieutenant-Governor congratulates the department on the progress made, but he hopes that it will not take undue advantage of its present monopoly by forcing the prices up too high. As at present advised he is not disposed to agree to a suggestion recently put forward that the Jallo plant should be transferred to a joint factory for the United Provinces and the Punjab to be located at Bareilly.

Such a transfer would deprive the Punjab of the benefit of the most successful industrial enterprise of recent years, which may play a large part in the future industrial development of the Province.

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The Imperial Agricultural Chemist (Mr. F. W. A. Davis, A.C.G.I., B.Sc., F.C.S., in his report for 1916-17 states:—The experiments on sweet potatoes (*Ipomoea batatas*) referred to in last year's report have been continued. Five varieties were grown on manured and unmanured soils. The effect of manuring was clearly marked in all the plots and it would appear that the application of manure would pay in the cultivation of sweet potatoes. Last year's result, that the best time of harvesting the crop is the middle of February, was confirmed this year. The analyses made show that the percentage of starch in the tubers continues to rise till about this time, after which it remains practically constant. There was, however, this year a well-defined increase in the yield of tubers after February, probably owing to rains which fell during the first week of February. It is possible that irrigation of the crop during the latter stages of growth would increase the output. A point of practical importance is that if the manufacture of starch be taken up on an estate, it might be inadvisable to restrict manufacture solely to the sweet potato as the latter would be available only during a short period, namely, about two or three months. In Bihar there is another root crop which is also very suitable for the manufacture of starch and comes on to the market at a different time of year. This is the *suthni* (*Dioscorea fasciculata*) mentioned in last year's report. If both crops are utilized the manufacture of starch would be continuous from November, when the harvest of *suthni* begins, until the end of January or early February when the crop of sweet potato would become available and enable manufacture to be continued until March. In July and August a

second crop of sweet potatoes would be obtained and could be utilized. A sample of starch manufactured from sweet potato (*Ipomæa batatas*) here has been very favourably reported on by Messrs. Reckitt & Sons, Ltd., Hull, who state that at the present time such a product would sell very readily in great Britain for industrial purposes provided that the Food Controller would allow it to be used. Messrs. Reckitt state that it is difficult to express a precise opinion as to its selling value, but it seems probable that it would fetch about £20 per ton.

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Basalt is a hard, dark-coloured rock of igneous origin, *i. e.*, produced by the solidification of molten lava. It occurs either as intrusive sheets, like the Edinburgh Castle Rock and Salisbury Craig in England, and some craggy promontories and hills seen in Southern Italy and on the coast of Eastern Mediterranean, or in vertical columns as in the Giant's Causeway in Ireland, in some parts of Calabria in Italy, in Syria, and other parts of the Near East. Basalt rocks also occur in Bohemia, Croatia, and the Balkans. It is now reported that an American firm operating in Australia has started works near Melbourne for turning the local basalt into "mineral wool" for use as an insulator in packing machinery and ice-chests, and as a substitute for asbestos. The basalt is melted down with a promotion of freestone (*i. e.*, any stone easily worked with tools, but especially fine-grained sandstone) and limestone, and then steam, at an immense pressure, is forced through the fluid. The liquid rock thus aerated flies into the air and falls in flakes on the floor. The process is apparently simple and inexpensive, and if the product proves a good substitute for asbestos there is every possibility that a new mining industry may be created in certain districts in the Near East where basalt, freestone and limestone are

often found in close proximity and not far from the sea.

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On a previous occasion we alluded to the value of Sorghum, or Indian Millet, as a sugar producing plant. Its cultivation is now seriously advocated by eminent botanists and scientists, who claim that this plant is capable of producing a very large part of the country's needs in sugar and paper pulp, and even colouring ingredients; while its flour can compare very favourably with wheat flour. The sorghum plant contains from 10 to 15 per cent of sugar, compared with 16 to 18 per cent in beet, but as a crop it is much more economical and requires far less attention. In addition to sugar, sorghum will produce paper pulp representing something like two tons per acre.

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The following passage is from the Report on the Administration of the Rewa State for 1915-16:—The State Lac Factory was a success this year after several years' continued losses.

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The Board of Trade Journal says:—There has been much discussion in the German press recently concerning a wood-pulp fibre named cellulon, for which large claims are made as an efficient substitute for jute, cotton and other fibres. Swiss spinners and weavers are keenly watching developments and they already regard cellulon as considerably important. The British Consul-General at Zurich describes the cloth made from cellulon as being extremely strong.

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With reference to the article on "Difficulties in the way of Industrial Progress" published in the March issue of this *Journal* we would mention that it was sent by the author while still in England and owing to pressure on our space could not be published in the *Journal* earlier than last month.

GLEANINGS.

That a market for virtually all of the waste of a planing mill is to be had for the seeking is evidenced in the occasional bringing to light of what is being done by some planing mill managers in certain parts of the world. The latest has to do with a planing mill in the Northern States of Canada. In turning out some of its products waste blocks of various sizes were numerous and served to furnish all the fuel required for the plant. This material had a fuel value of \$3 a ton. One day a visitor looked the plant over, noted the waste blocks and began to figure out the number of them in a ton. He offered the manager \$17 a ton for all the waste of that character turned out. A contract was made and the visitor informed the manager he was a toy manufacturer and that the blocks purchased would cost him less than half of what it cost him to make them. The mill manager immediately placed his thinking cap in order, secured samples of all the planing mill waste, called on other toy manufacturers and before returning home found a market for all the waste about the plant except the saw dust. The final result is that the sale of the waste purchases all the coal needed for the plant and leaves a profit averaging \$300 a month to the company. A little analysis of the waste products about the saw and planing mills would soon prove that much of the material going to the slab pit has an excellent commercial value, says the *Canadian Forestry Journal*.

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The important place that the banana has come to occupy in the American dietary is not generally appreciated. During the calendar year 1916 over 6,300,000,000 bananas were imported into the United States. Three bananas usually sell for five cents and weigh about one pound. At five cents a pound bananas are about the cheap-

est food in the market. Their nutritious value is high and they are exceedingly healthy. The chief importer of bananas is the United Fruit Company. It has scientifically developed and increased its trade and its supply, which is obtained chiefly in central America and the islands of Carribean. It has a fine fleet of steamers. Three of them are 8,000 ton vessels. They are fine ships especially constructed for the service. They have been commandeered by the Government as their transports and their withdrawal will mean a weekly reduction of 7,410,000 bananas in our imports of that fruit. If this be necessary we suppose it can be endured but we wish that it were possible to avoid thus reducing the supply of a food that is so wholesome and so cheap.

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In the study of wood using industries N. Y. State foresters have discovered one, Onondaga County man who has an interesting water power saw mill with which he does custom sawing. When the power is not needed for the sawmill he runs either a grist mill, or a cider mill with it. He also has a small electric light plant which is operated by the same power. The mill has been in operation for more than twenty-five years. Full and profitable utilisation of the woodlot products will be assured only when the State is dotted with these "many-purpose" mills which were so common in former days. Co-operative mills are suggested as a good financial move in New York farming Communities

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According to information from neutral sources Germany is meeting with obstacles in the floatation of her seventh war loan. Special inducements are being offered to the people, and efforts are said to be making for the sale of bonds in Switzerland, Denmark and Sweden. Germany's growing debt is a matter of grave concern to the Government which staked everything on a

short war and expected compensation in indemnities. Hence no preliminary arrangements were made to pay for the war out of current revenue. Another thing worrying Germany is the trade outlook after the war. The organ of the Krupps is credited with an allied campaign to destroy her industry.

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In an address before bankers at Atlantic City, R. H. Brand, Vice-chairman of the British War Mission in the United States, estimated Great Britain's expenditure in the War at \$ 22,000,000 daily. Before the War, England's income from abroad in an interest, dividends, shipping and Insurance dues and banking Commissions was computed at \$ 1,600,000,000, he said and that sum has been greatly reduced by the resale of securities to this country and so on. His conclusion was that the United States must bear the financial burden of the war and maintain the credit of the Allies.

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The report of the United States Forest Service for the fiscal year ending June 30 last, will show that the national forests are now almost self-sustaining. Receipts during the last fiscal year aggregated about \$ 3,450,000, mostly from timber sales and permits for grazing, water power development and other purposes, compared with a total cost of operating the national forests of about \$ 4,000,000. These in touch with the situation predict that during the current fiscal year the national forests will probably pay all expenses from the proceeds of their operation.

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Attempts are being made, and with some hopes of success, to make Brighton an important diamond-cutting centre, rivalling those already well established and well known on the Continent. The idea is to employ wounded soldiers at the work, and those who have made the start are already doing such high class work that, as stated

above, the promoters hope that the industry has not only come to stay, but that it will assume considerable dimensions. The experiment was started by Mr. Oppenheimer, and the whole scheme is, from all accounts, in skilled hands.

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The problem of reforesting areas that are otherwise unproductive, should be considered by agriculturists. Perhaps next in importance to the disposal of brush and slash is the effect of close cutting on hill sides. In many instances, the clearing of trees from a slope has encouraged a washing of soil that not only ruins the slope but also buries the productive field and its foot and it greatly increases the damage done by brooks at flood conditions.

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The announcement that the Guaranty Trust Company of New York had become a member of the Federal Reserve Bank for this District was made last week. It is an important step toward the unification of the American banking system. The total resources of the Guaranty Trust Company are in excess of \$ 600,000,000 and its deposits are about \$ 500,000,000. It is thus the second large banking institution in the Country.

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Amsterdam cables state that the shortage of paper in Berlin has become so acute that some of the most important newspapers were on a recent day unable to appear. Other papers were limited in size. Virtually all the newspapers in Saxony have ceased publication for an indefinite period.

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According to the *Agricultural News* of Barbados, shark skin, tanned locally by the residents of Turks Islands near Jamaica, seems to have some future possibilities as an article of commerce. The tanning material used is Mangrove bark, and the process is described as being short and simple.

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Madrid advices state that American Engineers are studying plans for a railroad to be built directly from that capital to Paris.

TOPICS FROM ECONOMIC PERIODICALS.

Practical Hints on "Gur" Making.

The following is an extract from the first portion of an article on Practical Hints on "Gur"-Making by Mr. E. L. Rout, Inspector of Agriculture, Cuttack, which appeared in a recent issue of the *Agricultural Journal* of the Department of Agriculture, Bihar and Orissa:—

The preparation of *gur* by the simple method of boiling the sugar-cane juice in the iron evaporating pan forms the subject-matter of this small article. How this is done, what things are essential for obtaining perfect results and whether the manufacture of *gur* by this process is superior to the system in vogue locally are matters which will be described in detail in their proper place.

TIME OF HARVESTING.

Before commencing to extract juice from the sugar-cane it should be observed that the cane is perfectly mature. As the sugar-cane in a whole year crop and its time of sowing varies from January to March, cutting must not be done until the full period January to March has elapsed. For premature cutting is as harmful as a belated harvest. In the former case, the cane-cells are insufficiently developed and do not yield the requisite amount of saccharine juice while in the latter, the matured cane is deprived of the sap leaving the pith in the cells to almost resemble an empty honey-comb. The best test of maturity is to ascertain that the cane is sweet. An unripe cane possesses a peculiar greenish tint indicative of the fact that juice has not attained that degree of sweetness as will render the cane ready for crushing. Maturity is also ascertained from the turning into yellowish colour of the terminal leaves of the canes. The juice should be extracted the very day the cane is cut, else delay in doing so will entail loss in quantity and affect the quality of the *gur*.

ADJUSTMENT OF THE MILL.

No hard-and-fast rule need be laid down for the setting up of the mill. The mill should be placed on the ground on such a level as to suit the size of the bullocks to be worked with. The beam should be kept in a straight position and should never be allowed to touch the ground as that would break the axle and the rollers of the mill. The two rollers

should be tightened and pressed in close to each other, after removing the wooden beam and the pole-cap. In this way, a maximum of extraction is gained with a minimum of strain on the bullocks. It is always advisable to wash the rollers and the pan. The nuts on the top and bottom bars should be tightened alternately until the two rollers are adjusted. When no opening is visible through the two rollers, these may be considered as being properly set. All the parts should be thoroughly oiled, care being taken to see that no oil flows down the rollers to contaminate the juice. Put canes into the feeder three or four at a time, and not more, else the extraction will be unsatisfactory and the progress of the bullocks hindered.

After describing various patterns of pans and chulas, Mr. Rout continues:—It is very important to see that the pan is thoroughly rubbed out either by brick or pumice stone and then washed before the boiling operations commence from day to day. Omission to carry this out will result in the formation of a hard crust over the pan. The juice should be boiled immediately after extraction. If there be unavoidable delay in doing so, then the juice must be kept in shade and a pinch of quick-lime put in it in the proportion of one *tola* of lime to one maund of juice. This alkaline substance has the effect of preventing fermentation which entirely spoils the juice. Excessive lime imparts a dark-red colour to the *gur*. To obtain pure juice it should be strained through a piece of cloth. This is done by holding a sheet of cloth over the pan and pouring in the juice, taking care that the pan is filled about two inches from the brim.

For the purpose of fuel, the dried leaves and twigs of canes are principally used for sake of economy, although at the outset it may be necessary to burn brushwood and faggots. In a completely dry oven, it usually takes two-and-a-half to three hours to get ready one pan of *gur*.

During this operation it is absolutely necessary to have the following articles always at hand, *viz*:—a piece of straining cloth; an earthen vessel of water with cloth; a vessel for putting in refuse scum; an iron ladle with fine meshes; 2 oz. of soda-bicarbonate one rod, a foot long; an open-faced flat jar; and earthen jars for storing *gur*.

When the boiling has gone on for some time a scum will be noticed to appear on the surface. This should be allowed to thicken and then strained with the ladle. It should be strained twice more after an interval of, say, fifteen minutes and then left to form up more thickly. The sides of the pan must be kept continually sponged and wiped off of all dirt with a wet cloth. (During the course of boiling the scum will keep coming over to the margin of the

pan and if it be not taken off, the quality of the *gur* will be marred. The dirt also spoils the pan by forming a hard crust on it). When perfect ebullition takes place a pinch or two of bicarbonate of soda may be put in. This helps to clean the juice and bring out a fresh scum of dirt. Then lift out the liquid with the ladle applying the wet sponge to the sides of the pan. After an interval of fifteen minutes, put another pinch of soda. All dirty matter must be scrupulously removed. During the last stage of boiling, the juice must be continually stirred with the ladle in order to keep it from boiling over. From this point the juice will begin to thicken in consistency and form by degrees into jaggery. It is important to observe the exact time when the jaggery is fit to be removed. An experienced man will be able to tell off and when the jaggery is ripe for removal. But any one of the following experiments will serve as a sure test:—

(a) When the last drops of water are being eliminated from the *gur* in the form of bubbles dip the ladle in the juice and hold it up. If the jaggery appears to drop in lumps, it may be taken as ready.

(b) Take a little jaggery with the forefinger and bring it into contact with the thumb. If on disconnecting the fingers the jaggery presents a ropy appearance it may then be regarded as ready.

(c) Put a drop of the jaggery in a cup of water. If it is observed to set immediately, it may be taken as perfect.

In deeper pans it may be necessary to prolong the boiling. Before removing the pan from the oven its load should be lightened by taking out a quantity of *gur*. Then transfer the contents to the earthen jars and allow them to cool. To obtain crystals, a small quantity of jaggery may be put in an open-faced jar and then stirred by means of a rod until it assumes a sandy texture. The whole of this is then to be blended with the rest of the *gur* and lightly stirred for some time and then left to cool down.

The *gur* must be kept in earthen vessels closed with either an earthen lid or cloth, plastered over with earth. When preserved in tin vessels the *gur* savours of the metal.

During the rainy season most of the *gur* gets liquefied. Although this is partly due to the moisture-absorbing nature of the crystals, the method adopted in their manufacture is responsible for much. If the *gur* be allowed to boil hard and crystallise immediately, there is less chance of fermentation.

Sugar Industry in India.

The following are extracts from an article by Mr. Wynne Sayer, B.A., Assistant to the Agricultural Adviser to the Government of India in the current number of *The Agricultural Journal of India*.—

In these days when every effort is being made to make the British Empire self-supporting the question whether the Empire cannot in future do without the beet-sugar grown by the enemy countries is engaging much attention. It has recently gone the round of the daily press that the Home Government are out to encourage the cultivation of sugar beet in the United Kingdom, and that in Jamaica and the West Indies the question of State-aided central sugar factories is being satisfactorily dealt with. It is understood that there is much room for the development of the sugar-cane crop in several British Colonies, and there is every reason to hope that with more intensive cultivation the output will be considerably increased. It is held in some quarters that if India alone improves her output, her present acreage of 2,437,000 under cane (with about 175,000 acres under sugar-yielding palms, etc.), will not only enable her to meet her own requirements of both raw and refined sugar and thereby set free the quantity of sugar at present imported, but also to export her surplus produce. It is pointed out in this connection that the imports of over 800,000 tons of refined sugar into India in normal times cannot be supplied by the British Empire without creating a deficiency of supply elsewhere, since the total output of the British Colonies, excluding the home consumption at the producing centres, is only about 880,000 tons.

Now what are the peculiar difficulties that the white sugar industry has to contend with in India? Some place in the fore-front the class of canes grown in India and point out that in Northern India, where nearly 90 per cent of the sugar-cane is grown, thin, hard, fibrous varieties generally unsuitable for the economical production of sugar preponderate. It is true that canes in Northern India only contain 9 to 11 per cent of sucrose (varying with the season) while in Java and other sugar producing countries it is 12 to 13 per cent and even more. It is also true that the yield per acre is about forty tons in Java; while in the best sugar-growing tracts of the United Provinces the average is about twenty and that elsewhere in Northern India, except the Punjab, it is about 15 tons.

Another difficulty pointed out is the existence of the *gur* industry on account of which the relative

profitableness of the conversion of cane juice into *gur* and sugar has to be considered in each tract before any decision can be reached as to the possibility of founding a factory there. Sugar is not an essential food of the majority of the people, who prefer jaggery or *gur*. The *gur* being peculiar its price is unaffected by the fluctuations in the world's sugar markets.

Minute sub-division of the land is also considered a great hindrance in the way of sugar factories in India. For commercial success the factories should naturally be as large as possible. A large block of land is consequently needed, so compact as to reduce the heavy carting charges to a minimum, and the factory should have control over the fields so that it may be kept constantly and evenly supplied with cane.

In the North-west Frontier Province which has 32,000 acres under cane, the district of Peshawar alone commands 24,000 acres and this area is capable of being doubled as the result of the Upper Swat River Canal. Here the growth of beet has been found to be fairly satisfactory. In addition this district, being far removed from the sea, has some sort of natural protection. A factory, if started here, would be able to work for a sufficiently long season (nearly six months).

It is also shown that we can manufacture sugar at a sufficiently low cost in India to compete with foreign sugar if up-to-date factories are set up and a sufficient supply of cane is available at a reasonable rate. As a matter of fact the factory at Pilibhit and the sugar factories in Bihar were running successfully even before the war. As a modern factory requires only half the quantity of cane required by a Khandsari for the manufacture of a ton of sugar, it is obvious that the former can afford to pay better rates than the latter. The introduction of these factories with proper organization and efficient management will therefore be a boon in those parts where sugar manufacture is relatively more profitable than *gur*-making. At present we import sixty-one lakhs of rupees worth of molasses—the by-product of sugar factories—and large quantities of molassécuite which is a cattle food prepared from molasses. If more sugar factories are opened in India they will be able to meet this demand and a license to manufacture rum will not be essential if steps are taken to further develop the use of these by-products within the country itself.

What is therefore required is encouragement on the part of Government for capitalists to come forward. How did the Japanese Government promote the sugar industry in Formosa? Why not institute a Government department giving facilities

to sugar companies for the erection of modern factories and at the same time multiply sugar experiment stations for testing and introducing better varieties of cane and improvements in cultivations?

We now turn to the question of the *gur* industry. Even here there is great room for improvement. To those who know how many industries in the world now carry on solely by the successful utilization of by-products and careful economizing at all points, it is heart-rending to see the waste that is going on in this particular industry in India. The cultivator works hard for periods varying from ten to eighteen months, sinks a lot of capital (having regard to his means) raises a successful crop with the limitations under which he has to work, *e.g.*, imperfect implements, inadequate supply of manure, etc., and yet because he does not know or because he has no means he fails to recover even a decent average amount of sugar from his crop, in fact reduces the possible output by 35 to 50 per cent and suffers in consequence. Could we but teach him that he wastes 20 per cent of the sucrose when crushing his cane by a bullock-driven mill and that all told a loss of nearly 35 to 50 per cent occurs in the whole process from the time the cane is cut to the complete manufacture of raw sugar, he would soon realise why it is that cane cultivation does not pay him as it ought to. The main point is that even with the existing varieties and the present low yields of cane per acre it is possible to make the industry more remunerative to the cultivator, to increase the supply of *gur* and make more raw sugar available in this country for refining, and thus indirectly to reduce her imports of foreign sugar.

To sum up. It has been made clear that the problem of the Indian Sugar Industry is a twofold one, and energetic measures should now be set on foot to place both the *gur* and the white sugar industries on a satisfactory working basis; to do this properly will require a survey to be made of the localities where white sugar factories can be erected and at the same time the districts where the cane cultivation is only capable of carrying a *gur* factory, should be carefully recorded. The financial side of the matter and the question of State assistance to the pioneer factories also require to be carefully examined. To do this will require a strong committee of experts who will also be able to report to Government how far the manufacture of sugar on a considerable scale, together with its by-product—alcohol—can be made the subject of excise control in India.

Dye-stuffs In America.

The following article is from the *Board of Trade Journal*.—

The issue of the official "Commerce Reports" (Washington) of August 15 publishes particulars of the dye-stuffs industry in the United States which have recently been collected by the Bureau of Foreign and Domestic Commerce.

An examination of returns made to the Bureau by practically the whole industry indicates an increasing tendency to amalgamation of interests among certain plants making crudes and intermediates with others producing finished dye-stuffs, which will probably result in the output of greater variety of colours at a decreased cost of production. Several instances are noted where two or more allied corporations have apparently pooled their interests in order to facilitate the manufacture and marketing of their products, while one recent amalgamation includes some of the largest plants in the country. Many of these corporations have branches in various cities of the United States, and a few have established agencies in London, Paris, Shanghai, and Latin-American capitals.

As far as actual figures are available, the total amount of capital invested in the industry in the United States would appear to be 160,025,660 dols. This amount does not include capital invested in dye-stuffs production by ten firms, some of which are just beginning operations, while others are not incorporated and have no capital stock, but are amply financed or are owned by a single individual. These plants will probably be in full operation by 1918, and several million dollars of capital will thus be added to the industry.

MONTHLY PRODUCTION.

From figures submitted by manufacturers, the following totals of monthly production for the current year have been compiled:—Twenty-two firms manufacturing crudes report a monthly output of 1,240,350 gallons of benzol, toluol, and some xylol and phenol, and 6,181,600 lb. of benzol, toluol natural and synthetic phenol, cresol, naphthalene, anthracene, and some xylol, cumol, and amylene; forty firms report a monthly output of 10,426,000 lb. of intermediates; forty-six firms had an output of 5,000,000 lb. of artificial colours per month; and thirteen firms an output per month of 8,183,500 lb. of vegetable dye-stuffs and extracts (including some tanning extracts not stated separately). For general purposes, it is said, these figures may be taken as fairly representative of the industry as a whole.

INTERMEDIATES.

The major portion of the total output of intermediates in the United States is probably consumed in the dye-stuffs industry itself although a large amount, especially trinitrotoluol, falls in the category of explosives. There is a constant increase in the variety of intermediates and chemicals produced in the United States for making colours. Dye-stuffs manufacturers are now producing large quantities of toluidines, resorcin, xylydine, dianisidine, naphthylamine, diphenylamine, tolidine, benzidine, benzaldehyde, benzylchloride, nitrobenzol, nitrotoluol, H-acid, phthalic, metanilic, sulfanilic, and naphthionic acids, naphthysulpho acids, naphthylaminsulfo acids, and amidonaphtholsulfo acids, Schaeffer's salt, paranitraniline, dimethylaniline, and numerous others.

A glacial acetic acid plant of large capacity is expected to begin operation in September, and will be of great assistance to the industry in general.

ARTIFICIAL COLOURS.

Coal-tar dyes in a variety of colours suitable for leather, textiles, straw, paper, inks, stains, pigments, varnishes, waxes, feathers, furs, and for many other purposes, are now regularly obtainable from domestic sources. Several manufacturers carry full lines of direct acid, basic, chrome, oil, and sulphur colours; while others confine their efforts to improving and extending their output of particular groups. Prominent among the colours produced are nigrosines, indulines, triphenylmethane dyes, safranines, eosines, chrysoidines, rhodamines, rosanilines, direct fast reds, browns and yellows for cotton, fast chrome colours for wool, Sudan colours, basic violets, synthetic indigo and indigotines, alkali blues for the silk and woollen industries and also for the lithographic trade, metanil yellow, methyl violet, methylene blue, benzopurpurine, benzo sky blue, primuline, naphthol green, rose bengale, galloxyaniline, and special chrome and khak colours.

Considerable attention is being given by about a dozen firms, to developing as rapidly as the requisite intermediates are available, the triphenylmethane dyes, particularly fuchsine, methyl violet, methylene blue, magenta, and malachite green. The itemised figures given by only a few of the plants show a monthly production of this series of colours amounting to 62,200 lb. Of this quantity 18,200 lb. represent methyl violet and 13,450 lb. methylene blue. Two manufacturers specialise on intermediates for these dyes.

There is a largely increased production and variety of reds, yellows, and scarlets. A wide range of fast reds, blues, greens, yellows, blacks and greys for cotton is also available.

Colours now produced on a commercial scale that were not made in the United States until recently are alizarin blues, browns, and yellows for calico printing, and for wool; para colours for lakes or pigments, vat dyes (sometimes called indigoids) for cotton shirtings and gingham, synthetic indigo, rhodamine, patent blue, and Biebrich scarlet.

VEGETABLE COLOURS AND EXTRACTS.

Present production and new developments contemplated include blacks and greens in natural colours for calico printers, a special logwood blue, special mordants for dyeing new shades in direct cotton colours, khaki dyes, cutch, archil, and logwood extracts, and powdered cudbear, orange and lemon flavines, Osage orange in a variety of shades, American sumac extract, indigotin, and natural indigo shades. It is stated by several plants that their output depends on the domestic demand, ample facilities being available for a largely increased production at any time. Some plants operate at half capacity, while others are running twenty-four hours a day.

One firm is making sulphur brown (not a coal-tar product) on an extensive scale, while another company is producing mineral colours in standard shades for wool.

Soluble Prussian blue, Chinese blue, pigment brown, lakes in all the principal colours, paratoners, dry colours, and dyes for lake makers are specialties handled by different manufacturers.

FUTURE DEVELOPMENTS CONTEMPLATED.

The most striking feature brought out in the returns furnished by the dye-stuffs manufacturers is stated to be the growth of the industry and the plans in process of formation for its continued expansion in both domestic and foreign fields.

Announcement has been received of the entrance into the dye-stuffs industry of the leading American company manufacturing explosives. Other new plants in process of construction or to begin operations before 1918 are two for coal-tar crudes, one for anthracene, one for glacial acetic acid, four new buildings for aniline dyes, one for chrysoidine and methylene blue, one for nigrosine, induline and magenta, and one for nigrosine only. A producer of direct acid, and chrome colours expects to double his present output of nearly 500,000 lb. annually during the next twelve months. One plant making methylene dyes is planning to double its capacity, two others making aniline colours will also double their capacity shortly, one manufacturer expected to have patent blue and fuchsine on the market after July, one of the larger corporations is now making auramine and lanafuchsine on a small scale and installing equipment for their increased output, and another contemplates the manufacture of primuline in considerable quantity. A producer of high-grade colours for silk is enlarging his factory and contemplates the early production of safranine, and the installation of a suitable plant for the extensive manufacture of aniline dyes.

Experimental research is in progress on a great variety of products that are now being manufactured on a semi-commercial scale with a view to increasing production as the processes are worked out in different establishments. *

Dyes and dye-stuffs exported from the United States during the fiscal year ending June, 30, 1917, were valued at 11,710,887 dols., as compared with 5,102,002 dols. in 1916. [Dollar=4s. 1½d. (at par)]

SPEECHES AND PRONOUNCEMENTS.

Developing the Nation's Talent.

Lord Haldane has been delivering numerous addresses to large audiences in the industrial centres of England and Scotland, advocating a bold progressive policy in education and enunciating new views with regard to an educated democracy. He is continuing his missionary work, which is all the more necessary since the Education Bill has been postponed. At the invitation of the Editor of the *Daily Chronicle* Lord Haldane has expressed his ideas on the subject in the following article:—

I wish to take an opportunity offered to me by the Editor of the *Daily Chronicle* of setting out some plain truths on almost important subject. After the war is over we as a nation shall have to rebuild our house thoroughly. We shall have to provide for that coming generation on whom depends the future of our people, and we shall have to provide for the coming reign of democracy. The new democracy will be very powerful, and if it is to have the best chances of real, as distinguished from nominal control, a high standard of knowledge must characterise it. Without that knowledge it will inevitably suffer diminution in stature, suffer it as the new democracy of Russia is suffering it to-day from the want of the cohesion which thought out purpose gives. There are signs that our people are beginning to realise this. A new kind of interest in education is growing up among them which puts large sections of the electors in advance of the House of Commons. It was not the people who decided to postpone the Education Bill to other things which could have waited better than can education.

AN AWAKENED INTEREST.

Of the awakening of interest in the subject among the masses I think there is no doubt the newspapers and magazines are bearing witness to the fact. The testimony of those who have been at public meetings is to the same effect. I have myself addressed numerous gatherings in various parts of the United Kingdom during the last twelve months. The audiences assembled to hear about education, and that alone. Where a comparatively short time ago only 200 or 300 could not have been got to come and listen, the hundreds were at these meetings multiplied into thousands. Why has this change

come about? It is because our working people are being penetrated with a new insight into the fact that knowledge is power. The labourer is coming to see that what puts the class to which he belongs at a disadvantage is want of the training which commands a premium, and which makes the trained mind capable of making the most of opportunity. There is a spiritual side, too, by which the man or woman who possesses this training is marked out as endowed with a new quality of mind, the quality which is given by the exercise of that communion with the highest intelligence which reading and reflection bring.

Thus democracy is beginning to turn its ear to another gospel. I wish first to say something about the social and material advance which his gospel offers to the working classes. It is not the only, or even the most important, advance, but it is a very great one, and it is yet only imperfectly realised by the public.

We have long ago passed away from the doctrine of Karl Marx that wealth is created by the capitalist, who dictates a wage which will just keep body and soul together, to an ever-increasing proletariat, forced by fear of hunger to compete for employment by him. To-day capital is hired in the open market from a multitude of investors, great and small, who buy shares in the joint-stock company in which their only real interest is a dividend which, taken over head, is not large. It is capital that to-day normally competes quite as much as labour for employment in great undertakings. The man who can organize these and, by inspiring confidence in his ability, induce others less competent to let him give directions which will result in the conversion of the potential energy of the resources which the earth possesses into kinetic energy, producing valuable industrial products and their accessories, this is the man who in these times really creates wealth as neither labourer nor the capitalist do. Such men are increasing in number. Their knowledge and capacity gives them a monopoly in the form of their talent. The real question is whether, now that capacity of direction has become the chief source of wealth, the possession and exercise of that capacity may not be more widely distributed and shared. It is the outcome of talent which in nine cases out of ten is only developed by training.

THE EDUCATED WORKER.

But the training is in the main a monopoly of the richer classes. Increase largely the number of the trained, and the monopoly will cease to be a monopoly. Things will adjust themselves. The educated worker will not play the mere part of a machine any more than he will live in a slum. He will begin to direct the machinery in his own

department and so lighten the monotony which is more or less incident to every form of work. The development of electrical power is at present in its infancy. Probably something approaching three times as much power as at present can be made available for industrial work if the potential energy of coal is converted into electrical current, instead of being largely wasted in local steam engines. It may well be, as the result of a more scientific organization which we can easily have if we are in earnest about it, that skilled men and women will be able to turn out two or three times the present amount of output in shorter hours, under less monotonous conditions, and with wages higher in proportion to the increase of output.

This is being accomplished in places in America, and even in some places here. But to make the change general requires organization and educated workmen, who can not only take their part in directing the new machinery, but in initiating and inventing. Only the stupid need do merely mechanical work under these conditions. No doubt nature will continue to insist that there shall be many who are too stupid to do more, but only a fraction in number of those who to-day are reduced to this kind of work for want of the capacity which mental training gives. We are only now realising the enormous advances of every kind which the application of science to industry may bring. We have at last started a new department of State activity. The Advisory Council for Scientific and Industrial Research has been entrusted with a million sterling to be devoted to the development of industry on the new lines to which I am referring. Increase of output with less merely manual labour will be the certain result of increases of the new knowledge. There is an infinity of directions in which that knowledge can be applied to bring about the changed conditions, but we are, thanks to our past indifference, only at the beginning of wisdom.

The extent to which the working-classes will share in the results of all this depends on the extent to which they are trained. For such training general education, and the variety of ideas and initiative which such education brings, are vital as the foundation. A national system of education, such as that for which Mr. Fisher's Bill seeks to lay broad foundations on which to build is thus essential. Will the democracy insist on having opportunities of education which will put their most gifted sons and daughters, on a level with those which the better-to-do have to-day? Much turns on it. In the first place, the State will benefit by the bringing in to activity of an immense amount of talent which under present conditions remains undeveloped.

A NEW ARISTOCRACY.

In the second place, a new aristocracy will begin to develop itself, a democratic elite of talent, and the existing sense of social injustice will tend gradually to disappear. In the third place, there is hardly a social problem which will not solve itself in response to the demands of an educated public. From housing to temperance, from wages to hours of labour, matters will begin, by the inherent pressure of ideas, to adjust themselves to the new standards. We have up to now put the cart before the horse in treating education as a reform which could be left until more obvious social questions had been disposed of. At the root of all these questions really lies education. Lastly, the standards of the democracy will be higher in the things of the mind. Wages and housing are not the only matters in which as a nation we need to make ourselves better. The habits of communion with what is high, through books, through the development of artistic taste, through ideals in thought and in religion which bring a new kind of satisfaction, these habits are what we must develop if our new democracy is to attain the true stature of the whole man.

It is to me a source of pleasure to see that in the recent movement for the re-organization of the programme of the Labour party the policy of progress couples, for the first time with sufficiently explicit words, Brain and Hand. These two are organic, the one to the other. They must not be allowed to remain separate to the extent they have been in the past, with the result of failure in the attainment of ideals. If the Labour party has highly resolved to take up this far-reaching principle and apply it with resolute earnestness, then indeed the promised land will be in sight from Mount Pisgah, and those who belong to the coming generation may enter and dwell in it.

The Future of the Cotton Industry in India.

"The Cotton Industry and its Future" was the subject of a lecture recently given before the Sydenham College of Commerce Students' Union by Mr. H. M. Mehta, of Messrs. H. M. Mehta & Co., of Bombay. The lecturer said:—

Many gentlemen have spoken on this subject before me, and they have dealt with it with copious figures and statistics; so I am not going to take up your valuable time with these facts and figures which are now a matter of history and can be found in many standard works written under the heading

of "Cotton." My object is to speak broadly on this great subject. Nearly half the population of Bombay, *i.e.*, half a million, is engaged or is dependent more or less upon this great industry, and more than one-fourth of a million is actively engaged in its daily operations. An industry of such magnitude, therefore, requires a close study on scientific lines, and it is therefore the duty of every enlightened citizen to take a keen part in its study to promote its interests. Cotton was grown in this country from times immemorial, but America, who started growing cotton about two centuries back, is now producing three times as much cotton as India produces. Not only America produces such a large quantity of cotton but she produces cotton of a far superior quality and staple than India does. America, Egypt, and East Africa are all employing the most scientific methods in preparing the soil to produce more lint per acre, and are using the most up-to-date implements. It is a pity that India does not use either the scientific methods to prepare the ground nor has up-to-date implements, but is labouring with the same primitive methods as were employed centuries back. Government should leave no stone unturned to promote the cultivation on most scientific lines and to educate the masses who are interested in cotton growing. The Agricultural Department, therefore, should establish depôts in every cotton-growing centre of importance where the selection of seeds and the preparation of ground should have their immediate attention. There are great possibilities if these activities are taken up on a very large scale both by the Government and by the large land-holders of cotton districts; and if this be done on proper lines, I see a bright future in a very short time.

WORK INDEPENDENT OF GOVERNMENT.

It is a pity that our present-day land-holders of cotton tracts are more or less money grabbers who take no interest in their soil and allow their soil to be tilled by ignorant farmers from whom they squeeze money. In America it is otherwise about. The holders of cotton tracts there study their soil carefully and scientifically, and rear it up as they would rear a child; not only that, but they employ those on their land who have some knowledge of agriculture, and take great pains to educate them by personal example and practical work at fields to secure the best results. They also see that their sons and heirs take the necessary education in agricultural schools and colleges to be useful to them in after life. When our land-holders take a similar interest in the land, a period of prosperity such as was never known before in India would set in. It is useless to depend upon the Government for everything. Government can only help to a certain

extent, and no more; it rests with those who are interested in the land to put their shoulders to the wheel and work out their own destiny. India is progressing rapidly under the British Rule. All the different industries are progressing, and many new industries of great importance are springing up, and the result of all these is apparent—that large sections of people are growing richer than they were a few years ago. It is, therefore, natural that, with more money coming in, and with the greater progress in civilization, the wants for finer materials will increase. The question is how to meet them? We are handicapped in our raw material, it being of much shorter staple than that of other countries, and consequently we cannot spin finer counts of yarn to produce cloths of finer qualities. Then, the question again arises that countries like England and Japan, though not producing a pound of raw materials, are producing cloths of very fine texture, and are able to meet requirements of all nations. If they can, why should we in India fail to produce the same result?

THE INSTANCE OF JAPAN.

That country, a few years ago, say, only twenty-five years ago, was almost a non-existing factor in the cotton industry, and used to buy very large quantities from India, America and England to satisfy its own requirements. But the Japs soon began to see what an amount of wealth was carried away from their country by the purchase of these goods; so they began to install mills in spite of their country not producing one pound of cotton, and by their diligence and hard-work, and certainly owing to the intelligence of their working classes, they have not only adapted themselves to this great new industry, but have become in such a short time quite masters of it. Not only have they ousted all the Indian yarns and cloths from their country, which we used to supply in millions of pounds, but they are now standing against us, and successfully too, as our competitors in the great markets of China, so much so that they are a standing menace, and the Bombay mills are convinced, day after day, that sooner or later they shall have to leave the great China market if they do not put their house in order and organize the industry to compete with them successfully. Not satisfied with throwing us out of their own country and capturing a large portion of our trade in China, they are now actually competing against us in our own markets by sending millions of pounds of yarn and cloth to India. Knowing that they do not produce any cotton in their own country and are dependent on America and India for raw materials, we must admit that it is a fine achievement for a nation. The question naturally arises, why it is so? And if they have

achieved such results in such a short time, why have we not obtained similar or better results though we had a long start of them? Are the Indians less intelligent than the Japanese or any other nation in conducting and developing this industry? My answer is: "No." Then what is the element that retards us from obtaining such results? My answer is

OUR MILL LABOUR.

There is no other question which engages the most serious attention of the captains of industry than that of labour. Though we have labour in plenty, we must admit that it is the most illiterate labour that any country possesses. The illiteracy among our labourers is of such an extent that hardly 2 per cent of them can read or write their own names, even in their own vernacular language. Owing to this illiteracy the working and labouring classes have no interest in their work; they only work mechanically without making the least use of their brains, and consequently, they do not care whether the work so produced is good, bad or indifferent. It is fortunate for the mill-owners that we have all the other advantages, which other competing countries do not possess, or else this great industry would have died its own death long before now. It is high time that the mill-owners should pay immediate attention to this great and burning question if they wish to see the industry to prosper and advance in course of time. They should devote their immediate attention to improving the condition of the working classes. The Indian cotton industry, on account of the great war and, to some extent on account of the excess import duty imposed upon the textiles of all other countries, is doing extremely well now and we are making phenomenal profits,—such profits as were not known before in the history of cotton-industry in India. It would therefore be a wise and timely step to take all measures, and devote large funds, for the improvement of the condition of their labourers. It is essential that sanitary dwellings should be provided, where they may be removed from the slums wherein they live more like beasts than human beings. Each mill should also allot a certain space where a school can be formed and half-timers, *i.e.*, boys and girls under the age of twelve, who are working in the mills for half a day according to the Government rules, can be given primary education suitable to this industry. These young folks in course of four or five years when they begin to grow up to manhood or womanhood, would naturally take more interest in their work and would try to improve their lot by better work and production, and thus strive to earn more wages to live comfortably. Every individual mill should also establish

a night-class, where lessons can be given to those who show a desire to take primary education. Play-grounds and libraries should also be established in course of time. These improvements, some may think, may involve a large and a recurring expense every year that would be a burden to the industry; but that idea should at once be removed from the mind, as on close study it would show that these expenses cannot be a burden, but in the long run would be a source of greater profits that may be derived by more intelligent and efficient work. The money spent on housing the labour will fetch interest from 4 to per cent and there it would be a good investment to the mill companies, and, at the same time, labourers being under the obligation of the masters would be more orderly, attentive, and regular in their work. The expenses to conduct the school-classes and provide books, etc., free, would not cost more than Rs. 200 a month, which is almost nothing to an up-to-date mill.

NEED FOR CO-OPERATION.

If the Government of India and the whole of the British Empire wish to see that India should hold its own after the war, then not a day should be lost to pass an Act making primary education free and compulsory all over the country. Self-governing bodies, like municipalities and the trades and mill associations, should also help the Government to achieve this desired end. It is a pity that we, who have been ruled by such an intelligent race like the British for over a century and a half, find that no more than even 10 per cent of the total population of the country can hardly read or write their names. This is a deplorable state of affairs and does not speak well of any Government, and it is high time that leading men of India and the Government should put their heads together and find out a way to raise the conditions of these illiterate millions. But we must not depend for everything on the Government; we should all strive and make a personal effort to uplift the illiterate, and if we all do our duty faithfully, I see a very bright future not only for the cotton industry but for all sorts of industries, making India as self-contained a country as any other prosperous country in the world.

Some of the leading citizens of India take a very active part in the politics of the country to attain self-government, which is a very laudable object in itself. But if these very gentlemen would devote some of their valuable time to raise a company of educated young men to go round small towns and villages and speak to the illiterate and impress on them the advantage of education, they would do far more immense service to the country. You young gentlemen should always remember that the

prosperity and advancement of all countries depend solely upon the intelligence of the working classes, and if that be achieved there is no power on earth which would stop them from attaining their fond aim of self-government. The present great war has proved beyond doubt what England has been capable of doing with the organization of their labour forces; in fact, only on account of the great intelligence of their working classes they, who had not been prepared for land war forces even to a very small extent, have done wonders—such wonders as the Germans never dreamt of in their remotest dream. We, Indians, should take a great lesson from this, and do all in our power to raise the standard of our labour if we expect to hold our own side by side with other enlightened peoples of the world.

ECONOMIC NOTES.

Fruit-Packing in India.

The following is an extract from the Report of the Imperial Economic Botanists for 1916-17, published with the Scientific Reports of the Agricultural Research Institute, Pusa:—

The sale of imported fruit boxes to the public during the year exceeded all expectations. It was stated in the last report that a large supply had been procured for 1916 more than sufficient to meet any demand that was likely to arise. Early in the season, however, the sales increased so rapidly that it was difficult for the staff available to place the boxes on the market fast enough. The Indian traders bought up all the crates and punnets before the season was half over and only a few peach boxes were carried over for 1917. During the season, 4,398 boxes and 366 punnets were sold, the proceeds amounting to Rs. 5,028. Had the stock been larger, boxes to the value of at least Rs. 7,500 would have been sold. The Indian dealers have now realized the value of the two-pound punnet, suitably arranged in crates, for the transport of grapes. By means of these crates, Baluchistan grapes reach distant cities of India like Madras, Bombay and Calcutta without damage. In consequence, the demand from India has increased and is likely to increase still further. The only thing needed for stimulating the grape trade was a suitable method of packing for transport and this

has now been provided. The valleys of Baluchistan are eminently suitable for the cultivation of grapes. The crop escapes the early frosts and little irrigation water is needed as the plants are grown in deep trenches protected from the drying winds. Very rarely is the crop damaged by rain during the ripening period. As regards the market, this is provided by the teeming population of India, a large proportion of whom are vegetarians who are willing to pay good prices for this fruit.

Baluchistan labours under one disadvantage as a fruit-producing area. This is the absence of a supply of cheap wood for the fruit boxes. The wood has either to be brought by sea from Norway or else hauled across the Punjab from the valleys of the Himalayas. The cost of freight on the box boards will always militate against the use of the light non-returnable package which is only used once. A method of getting over the difficulty is to use stronger crates and to arrange for their return to Quetta so that they can be used over and over again. If a crate would last for twenty or thirty double journeys to and from Quetta the cost of the package per trip would not be very great. It might then easily pay the more substantial merchants to put a certain amount of their capital into well made crates. A suitable returnable crate has been designed and has been on the market for the last two or three years. Its extensive adoption, however, was hampered by the rules in force on the railways relating to the weighing of consignments and to the return of empties. Through the good offices of the President of the Railway Board, these obstacles have been removed. Two suggested concessions for the fruit trade received the support of the Railway Board at the last meeting of the Railway Conference Association at Simla. These were that consignments of fruit should be grouped for purposes of charge and that returnable packages, approved by the North Western Railway, should be returned free of charge to Quetta, Gulistan or Chaman. This was agreed to by all the chief railways in India. During the present year the Agent (Sir Robert Gales) and the Traffic Manager (Mr. Boalch) visited the Fruit Experiment Station at Quetta and agreed to recommend to the other railways that the cardboard boxes as well the returnable crates should be returned free. These concessions are greatly appreciated by the fruit trade and are certain to help materially in the improvement of the industry.

RICE TRADE OF THE WORLD.

India's Share.

A recent number of the *Bulletin of the Imperial Institute* contains an article of seventy pages on the production and uses of rice. Practically all the rice-producing countries of the world are considered separately, in respect both of their rice crops and of their trade in rice and an attempt is made to arrive at some idea of the world's production of this important foodstuffs.

It is calculated that the output of cleaned rice in 1916-17, in all countries except China, amounted to about 60,000,000 tons. Of this the British Empire produced about 36,000,000 tons, mostly in India, where the crop (including an allowance of a million tons for Native States) was no less than 35,000,000 tons. Of the foreign production of 24,000,000 tons over 20,000,000 tons was grown in five countries—Japan, Netherlands, East Indies (chiefly Java), French Indo-China, Siam and Korea. Estimates of production in China are largely guess-work but the Imperial Institute, adopting the view that the output in China is not likely to be much inferior to the Indian crop and may exceed it, concludes that 40 per cent or a little less would be a fair allowance for India's proportion of the world's annual production of rice.

No less important is the position which India occupies in the world's rice trade as a source of supply for other countries. That is not a necessary consequence of its importance as a rice producer. Some of the countries of largest production—China, Japan, Netherlands, East Indies—do not grow enough to supply their own needs, though in the case of Japan the large increase in the rice crops in the last three years has changed a heavy import balance into an export balance, so far as the trade with foreign countries (*i.e.*, excluding Korea and Formosa) is concerned.

The world's export trade in rice is practically under the control of three countries, India, French Indo-China and Siam. It has been calculated that the quantity of rice which entered into international trade, as shown by the export returns of different countries, amounted in 1913 to about 6,400,000 tons. This includes exports from European countries of rice which has been milled in those countries, which came originally from India, Siam or Indo-China and which unduly swells the total by being counted twice over. Even so, the original exports of rice from

India amounted to 40 per cent of the total, while those from Indo-China were 20 per cent and those from Siam 18 per cent; in other words these three countries provided nearly four-fifths of the total.

India's export trade in rice is really dependent on Burma. Not only does Burma provide about three-fourths of the exports of rice from India as a whole (1,835,000 tons out of 2,420,000 tons in 1913-14), but Burma usually sends to other provinces of India more rice than those other provinces export. Without Burma, India would not be self-supporting in rice. As it is, India's exports of rice in the year before the war were equal to the gross requirements of the rest of the Empire, though actually only 42.6 per cent of the exports were to British countries and 57.4 per cent to foreign countries.

The exports direct to the United Kingdom were only between 6 and 7 per cent of the total. On the other hand, the United Kingdom imported considerable quantities of rice from Holland and Germany which had been first exported from India to these countries, and after being milled and polished there had been re-exported to the United Kingdom.

FORESTS IN THE PUNJAB.

Successful Departmental Enterprise.

According to the progress report of forest administration in the Punjab for the year ended June 30, two new irrigated plantations, at Terah on the Upper Bari Doab canal and at Dhaffar on the Uppper Jhelum canal, were sanctioned during the year; the scheme for maintaining 60,000 acres under irrigated plantations in the new colonies is now complete and substantial progress has already been made with the Khanewal and Chichawatni plantations on the Lower Bari Doab canal. When fully developed these plantations will form a most valuable fuel reserve and should yield a handsome return to Government. Susceptibility to frost considerably restricts the choice of species to be planted. The Lieutenant-Governor of the Punjab hopes, however, that this will not prevent a sufficient variety of trees being grown, and that experiments in this direction will be continued. In those areas where it has not been possible to start planting the land has

been given out on temporary cultivation, which will bring in an appreciable income and facilitate subsequent planting.

There is now some reason to hope that the liberal policy which is being pursued will lead the people to accept the principle of communal responsibility for protection of the forests from fire, a principle which can be enforced only if the law is amended so as to permit communal punishment for fires proved to be caused by malice. A suggestion for such an amendment has recently been made to the Government of India. Meanwhile the Lieutenant-Governor agrees with the Conservator that much may be done towards associating the people with the working of the departments by providing the villagers with remunerative employment in the forests on the lines which have proved successful in the Murree and Kahuta tahsils. The opposition to forest conservancy, as the Conservator indicates, is mainly economic in its origin, and this fact is being recognised by the department.

There was a slight decrease in the area open to grazing during the year, representing a reversion from the abnormal conditions of 1915-16, when the drought necessitated the opening of rakhs to free grazing, but it is worthy of note that 81 per cent. of the forest area was open to grazing of all kinds during the year. The revenue from grazing and fodder grass rose from Rs. 1,79,045 to Rs. 1,96,879, while the total value of grass and grazing of all kinds provided exceeded Rs. 22½ lakhs. In other words the direct pecuniary benefit to the stock-owners of the Province amounted to more than Rs. 20 lakhs, even in a year of exceptionally ample rainfall. That fact in itself would gratify the maintenance of the forests in the interests of the people, and quite apart from the revenues that Government derives from them, for if these areas were not under forest management their value as fuel and fodder reserves for the people would be infinitely less.

The quantity of timber extracted fell from 9½ to 8¼ million cubic feet and that of fuel from 30 to 29 million. There was a small decrease in the amount extracted by departmental agency, but the Lieutenant-Governor agrees with the Conservator that this branch of the department's work will have to be greatly extended in the near future. The war has greatly stimulated the demand for timber and it is practically certain that after the conclusion of peace Indian railways will require large quantities for conversion into sleepers. Sir Michael O'Dwyer understands that expert opinion now generally takes the view that direct management by the department would yield a better return from the hill forests, which are remote and difficult to work, than the

system of leasing large areas to contractors, and it was largely owing to this consideration that he recommended the reorganization and strengthening of the superior controlling staff which has now been sanctioned by the Secretary of State. Under the industrial conditions now prevailing in the Punjab the difficult problems of extraction and transport, on the solution of which the fuller utilization of the immense potential resources of the Himalayan forests mainly depends, can be best dealt with by the expert agency of the department. A beginning has already been made in the substitution of mechanical transport for carriage by bullock-carts and camels, and a rapid advance in this direction may be expected when materials become available. But larger problems will inevitably arise in the near future, and steps have consequently been taken to secure for the Punjab the services of two expert Forest Engineers.

The resin industry is an excellent example of successful departmental enterprise. By the end of the year more than half a million blazes were being tapped, one-sixth being in Kangra where tapping has now been undertaken for the first time. The factory at Jallo worked continuously through the cold weather, and the plant gave complete satisfaction: the monthly output reached the creditable average of 4,000 maunds of resin, in addition to over 40,000 gallons of turpentine, and the quality has now been pronounced fit for the European market. At the same time the cessation of imports from abroad has greatly raised prices, and the year has therefore been financially most successful, the profit Rs. 1,31,524 more than covering the entire cost of the distillery. The Lieutenant-Governor congratulates the department on the progress made, but he hopes that it will not take undue advantage of its present monopoly by forcing the prices up too high. As at present advised he is not disposed to agree to a suggestion recently put forward that the Jallo plant should be transferred to a joint factory for the United Provinces and the Punjab to be located at Bareilly. Such a transfer would deprive the Punjab of the benefit of the most successful industrial enterprise of recent years, which may play a large part in the future industrial development of the Province.

SUGAR-CANE AND ITS BY-PRODUCTS.

Experiments in Assam.

In his report of the Agricultural Department, Assam, for the year ending June 30, 1917, the Director of Agriculture, says:—

The sugar-cane experiments at Jorhat mainly consisted in the testing of local and exotic varieties, manurial experiments and trials of different planting methods. The varieties tested against each other were B 147, B 376, Striped Mauritius, Kheri, Magh, Maghsport, and the two new promising varieties Barbadoes A and B 6450 obtained in 1914. The new varieties of Barbadoes gave a very good account of themselves and promise well. As usual the other exotic varieties also did very well, Striped Mauritius being the best, while the sport of the local variety Magh surpassed its parent in yield and quality of juice. The average yield for all varieties taken together was 30 tons per acre, while Barbadoes A alone gave 39.4 tons per acre on the phosphated area. The phosphated plots in almost every case gave a considerable increase over the non-phosphated but otherwise similarly manured plots. The phosphate used in these experiments is a raw mineral deposit of Indian origin. It applied once in the rotation, *i.e.*, every fourth year previous to the sowing of the green crop which precedes the plant cane. This work has not proceeded far enough as yet to admit of any final verdict as to the value of the phosphate. The rotation has so far only matured on one cane block, the result being a net profit of Rs. 39.6 per acre, *i.e.*, of about Rs. 10 per acre per annum. The results of planting experiments confirm the experience of previous years that, within the limits of three to five feet between rows, the narrower planting gives the bigger crops and not more than eight to ten thousand setts per acre can be economically used. Six new varieties received in 1915 from Dr. Barber, Government Sugar-cane Expert, were multiplied on the nursery and B 3412 and J 33 A did well. During the cold weather over 107,000, setts of the three varieties B 376, Striped Mauritius, and B 147, were sent out for distribution.

During the year under report work at the Kamrup Sugar Farm made much progress though for various reasons many difficulties were met with in regard to the manufacturing side. The area reclaimed and under cultivation at the close of the year was 650 acres in all, of which some 500 acres are now under cane, plant and ratoon. The soil of the farm is a good loam and fertile and very suitable for sugar-cane. The annual rainfall being

high, though well distributed, demands a light free draining soil such as exists here. The system of drainage adopted in the previous year having proved very efficient was extended to the new area and worked quite satisfactorily. The water table has been considerably lowered and surface accumulations even after heaviest falls of rain are now things of the past. Planting of the new cane began in the middle of February and was finished by the end of March. The varieties cultivated were Striped Mauritius, Barbadoes 147 and 376, but the prospects of the crop are not so favourable as they were at this time in the previous year owing to drought after planting. The crop of 1916 was good one, the average outturn being estimated at 20 tons per acre. The ripening season was perfect and the canes matured their juice properly. The Agricultural Chemist made analyses of the crop at various periods. The plant canes of all three varieties were found very rich in sucrose, averaging about 15 per cent in cane when ripe. During the year the question of handling the crop arose and a contract was made with Mr. W. Maxwell, who erected a *gur* factory on the farm to deal with the canes. Cane was supplied to him on a sliding scale based on the sucrose content and the price obtained for the *gur*. Owing to unavoidable delay in the arrival of machinery and plant and climatic and other difficulties crushing did not commence till the middle of February.

After a little time the manufacture of *gur* on a large scale with open evaporators was found to be impracticable. Some 775 tons of cane was dealt with in the factory, the remainder of the crop being thrown away or distributed for setts, some 225,000 cuttings being sent out for sale or demonstration purposes. It is only fair to Mr. Maxwell to say that it was largely due to delay in completion of the contract that more could not be accomplished this year. The *gur* factory is now being converted into a white sugar factory on modern lines, and it is intended to convert the crop now on the ground direct into white sugar next cold weather, but considerable difficulties are being experienced in the procuring of machinery.

STATISTICS.

Trade in Perfumery.

The following note on the Far Eastern market for perfumery is from the *London Chamber of Commerce Journal*:—

In the Malay Peninsula, where there is a large trade done in perfumery and cosmetics, British manufacturers, in pre-war days, found Belgium, Germany, and Japan their strongest competitors. It may be that Belgium occupies a false position, for its principal port—Antwerp—was one of the outlets of German trade; and, since the Straits Settlements statistics, from which the following information is derived, record merely the country of shipment and not the country of origin, it is not always possible to obtain reliable facts as to the real trade of any one country. For the last four years the imports of perfumery and cosmetics into the Straits Settlements were valued: In 1913, at \$502,505; in 1914, at \$323,360; in 1915, at \$405,635; in 1916, at \$596,260. In the case of 1916 here may have been some overlapping and the increase is likely to be more of value than of quantity; but it is certain that the trade was a substantial one in spite of the continuance of the war, and it will be interesting to see from the detailed statistics of 1916, when they are available, what share of the increase has fallen to Japan and other Asiatic countries. As it is comparison can be made for three years only, as below:—

Imported from	1913	1914	1915
United States	\$21,040	\$13,585	\$38,220
Austria-Hungary	1,715	1,590	...
Belgium	135,560	65,055	...
British India	11,520	9,685	8,860
France	24,070	16,495	117,265
Germany	53,680	25,865	...
Hongkong	30,835	33,325	45,710
Japan	80,705	64,065	78,925
Netherlands	12,855	5,980	8,390
United Kingdom	125,815	86,090	104,385
Other Countries	4,710	1,625	3,880
Total	502,505	323,360	405,635

Apart from the elimination of Belgium, Germany, and Austria-Hungary, from the table in 1915, the most remarkable feature is the jump taken by France into first place. The United States also shows a substantial increase. As cosmetics and perfumery are luxuries, and the absorption of luxuries gives some indication of the prosperity of a people, it may be deduced that the Malay Peninsula is prospering and constitutes a good market for this class of goods.

Petroleum in India.

The following extract is taken from Mr. H. H. Haydens' Report on the *Mineral Production of India* during 1916 :—

There was a further increase, amounting to 10,000,000 gallons in the output of petroleum in Burma and India, the total production in 1916 being 297,189,787 gallons. So far as Burma is concerned, however, the returns are shown according to districts rather than by oil-fields, although in most cases only one field is included in a district. In the case of Magwe district, however, owing to a rearrangement of boundaries, two fields, Yenangyaung and Singu, have been included in that district since July 1, 1916, the date on which the Singu oil-field was transferred from the Myingyan district to Magwe. Consequently, the returns for Magwe include the productions of Yenangyaung for the whole year and that of Singu for the second half of the year. On the other hand, the return shown under Myingyan gives the production of the Singu field for only the first six months of 1916. The actual production of that field was about 86,000,000 gallons, of which 44,000,000 gallons were produced during the first half of the year and are shown separately under Myingyan, while the remaining 42,000,000 gallons are included in the returns for Magwe. Almost the whole of the increase in the output of India and Burma for the year is to be attributed to the Singu oil-field, of which the output increased by about, 9,000,000 gallons. There was an insignificant decrease in the output of Yenangyaung. In India the Digboi field increased its output by about 750,000 gallons, while the new Khaur field in the Attock district of the Punjab produced slightly less than in 1915. Operations in that field, however, were still only in the experimental stage at the end of the year under review.

Sandal-wood Oil in Mysore.

It is stated in the Mysore Administration Report for 1916-17 that the sandal-wood oil factory at Bangalore started work on May 10, 1916, and manufactured 50,690 pounds of oil up to the end of June, 1917. A net profit of Rs. 5,03,058 (after paying Rs. 8,07,947 to the Forest department for sandal-wood) was realised during the period. The value of the oil sold and in transit to the London Agency amounted to Rs. 5,80,992. The construction of another factory at Mysore at an estimated cost of three lakhs of rupees was undertaken during the year and the work is nearing completion. The industry is placed on a scientific basis and the Mysore oil commands a good price on the London Market. The services of two Professors of the Indian Institute of Science as consulting chemists have been secured, and before shipment, a sample is taken from each consignment of oil, and a certificate of purity issued under their signature.

Fish-Curing in Cochin.

It is stated in the Administration Report of Cochin for the year 1092 M. E. (August 16, 1916, to August 16, 1917) that Fish-curing operations have shown a slight increase in the year. The quantity of fish cured during the year was 32,422 maunds. The receipts and expenditure on account of the Yard were Rs. 2,568 and Rs. 2,932 respectively, the transactions resulting in a deficit of Rs. 364, as against Rs. 16 in the previous year. The increase in the deficit is due to the increase in the cost price of salt supplied to the Yard by one anna a maund according to the new salt agreement and also to the increase in the balance of salt remaining in the Yard. Deducting the price of this salt, the amount of deficit is reduced to Rs. 244. A reduction in the issue price of salt is proposed in the current year if possible, and with this reduction the deficit on account of the Yard now noticed, will, it is hoped, disappear.

MYSORE ECONOMIC CONFERENCE.

PROGRESS IN THE DISTRICTS.

Shimoga.

AGRICULTURE.

Sericulture.—The District Committee resolved that the services of a Sericulture Inspector for a period of three months be asked for investigating into the possibilities of introducing Sericulture into the taluks of Channagiri and Honnali.

EDUCATION.

School Buildings, etc.—A contribution of Rs. 80 has been made by Purle Village Committee for the school building. Mr. C. Bhima Rao has raised a contribution of Rs. 300 till now for the construction of a school building and a rest house at Nuggihalli.

Starting of Schools.—Mr. C. Bhima Rao has started a Kannada and a Hindustani Girls' School at Nuggihalli.

Grant of Concessions.—The District Committee resolved to recommend to Government for the grant of certain concessions for the improvement of the Shimoga Town Library and Reading Room.

Award of Scholarships.—In the matter of awarding scholarships to the depressed classes under group C for industrial and other classes, the Committee resolved that the following scale be recommended:—Four rupees a month to students in the Industrial School and Home Industries Classes. Rupee one a month to students in Practical Instruction Classes. The age of the students entitled to these scholarships should be between 12 and 18.)

INDUSTRIES AND COMMERCE.

Rice Mill at Shimoga.—The District Committee resolved that Government be moved to grant permission to the Government officers and officials in the Shimoga District to take up shares in the Joint-stock Company formed for starting a rice mill in Shimoga.

Thirthahalli Tile Works.—The District Committee were in favour of the Thirthahalli Tile Works being handed over to Government management in the interest of the development of this industry.

A Practical Instruction Class.—A practical instruction class in Book-binding in connection with the A. V. School at Sorab was sanctioned.

TALUK PROGRESS REPORTS.

Shimoga Taluk.

Two night schools were newly started in the Taluk. Ten persons have been chosen for receiving instructions in the weaving practical instruction class at Mangote. Practical instruction classes in shoe-making for Madigas and in mat-making for others were started at Benkipur. One hundred mango plants were planted at Byadrahosahalli.

CONFERENCES AND MEETINGS.

Malur.

The Second Conference of the Malur Taluk was held in the Government School Hall at Malur, on the 14th February, 1918, under the presidency of Mr. B. Venkoba Rao, B.A., Deputy Commissioner, Kolar District. There was an industrial exhibition also held on the occasion. Both of these were well attended by the official and non-official representatives of the Taluk. The Chairman in the course of his introductory remarks thanked Mr. S. Narayana Rao, Sub-Division Officer for kindly inviting him to preside on the occasion, and said:—
“I notice from your Agenda that you have some interesting questions for discussion. The provision of sufficient medical relief for the rural population is a vital matter and from one of the Taluks I have received a proposal that buildings for Vaidyasalas should be considered as works for which the Village Improvement grant should be made available. Your proposal that the Deputy Commissioner should have funds and power to sanction estimates for the construction of school houses shows how keen you are to accelerate the rate of progress with regard to the spread of education. Your reference to the Tile Factory at Malur is quite timely, because there is a proposal to have the Tile Factory in Kolar and probably the final selection of the place for the tile factory will depend partly on whether you or the people of Kolar raise the necessary capital first. I quite welcome your solicitude for the more extended cultivation of sandal trees and I hope that in the course of the discussions to-day, you will be able to make workable proposals acceptable to all concerned. There are also other important points for discussion which will be brought up in due course.” He then declared the Conference open and requested that the Report of the Progress Committee be read. Mr. M. Ramaswamiah, the Amildar of the Taluk, read an interesting Report which showed that seventy-five buildings of an

aggregate value of about Rs. 20,000, had been constructed, and that there were in all thirteen school houses, thirty-six village halls and *musafir-khanas* newly built in the different parts of the Taluk. After the luncheon-interval, the major and minor wants of the Taluk were discussed with the Sub-Division Officer in the Chair. With three cheers to His Highness the Maharaja of Mysore and the other members of the Royal family, the Conference terminated.

Mysore,

The second Conference of the Mysore District was held in the Public Office buildings on 26th, 27th and 28th February, 1918, under the presidency of Mr. K. Mathan, B.A., Deputy Commissioner, in the chair. The proceedings commenced with a short and interesting speech by the President explaining the objects of the Conference, its constitution, etc. On the first day the reports of work done in the district during the year 1916-17 under the Village Improvement Scheme, Irrigation, Tank Panchayat, Village Forests, Village Courts, Village Savings Banks and Sanitation including Rural Water-supply were read by Messrs. C. B. Laxmana Rau Seetharamiah, P. S. Govinda Rau, S. N. Sri Narasimha Sastry, K. Kesvachar and Srinivasa Rau, Pedipet, respectively. On the following day the reports of work done in the District under Education, Industries and Agriculture were read by Mr. S. N. Sri Narasimha Sastry; and on the last day Mr. T. Venkataramanah, the Senior Inspector of Co-operative Societies read the report of work done under Co-operation. The reading of each report was followed by the expression of opinions by the delegates on the points dealt with therein and by the discussion of subjects and major and minor wants under that particular head. Twelve silver plates with suitable inscriptions of the value of Rs. 50 each were awarded to the Chairmen of the Committees of best kept villages in twelve out of the fourteen taluks in the District. The President concluded the proceedings of the Conference with an interesting and instructive speech which brought to the notice of the audience the important points discussed and resolutions passed.

SHOWS AND EXHIBITIONS.

Cattle Show at Anthargatta.

In connection with Durgamma *Jatra* at Anthargatta, Kadur Taluk, a Cattle Show was held on the 23rd February, 1918. There were about 2,000 heads of cattle at the Show, and a Committee of five gentlemen was appointed to judge and award prizes to the owners of deserving cattle. Two

hundred cattle were selected and brought to the Exhibition ground and of these, prizes were awarded to four breeding bulls, six draught bullocks and four plough bullocks. A special prize of Rs. three was awarded to Ninge Gowda of Bagadi village for his goat by Revanna Siddappa, a merchant of Asandi. Mr. S. Srinivasa Iyengar, the Amildar of the Taluk, distributed the prizes. Lectures on the utility of Cattle Shows, Village Improvements, Co-operative Societies, etc., were delivered on the occasion.

EDUCATION COMMITTEE.

The Boy Scouts of Mysore.

Under the patronage and auspices of the Government of the State, the Boy Scout Movement is now being introduced into Mysore. As Director of "The Boy Scouts of Mysore" the services of Mr. Frank C. Irwin, B.A., a Canadian who has had considerable experience in Scouting and general boy welfare work in Canada and the United States, have been secured. Mr. Irwin is working under the direction of the Inspector-General of Education.

As a first step towards organization a class of about thirty teachers and others dealing with boys was convened at the Government High School, Bangalore, on April 22nd, for training in the principles and methods of Boy Scout work. Mr. Irwin is in charge of the course and is giving the lectures and instruction in Scout History, Organization and Requirements. Two lectures on "The Adolescent Boy" have been given by Mr. V. M. Ilahi Buksh, B.A., LL.B. Dr. H. B. Mylvaganam, F.R.C.S. (Eng.) is giving half a dozen lectures and demonstrations on "First Aid to the Injured." Mr. B. Rama Rao, B.A., Special Officer for Physical Education, lectures on "Health and Endurance" and conducts, on alternate days, an instruction period devoted to Physical Drill. Mr. J. R. Isaac, B.A., will give a lecture on "Chivalry and Morality" towards the end of the course and arrangements are being made for the services of a naturalist to conduct two or three Saturday afternoon nature study trips. At the close of the course examinations will be conducted in the theory and practice of "Scouting".

The aim of the course is to give the prospective "Scout Masters" attending it a thorough acquaintance with the principles and methods of Boy Scout work in order that they themselves can go back to their various towns and cities and start Scout troops of their own. By personal visits to various centres in the State Mr. Irwin hopes to be able to assist the men in this.

THE SCOUT MOTTO.

"Be Prepared."

The Scout's Promise :--

"On my Honour I promise that I will do my best

1. To do my duty to God, The King-Emperor and the Maharaja of Mysore.
2. To help other people at all times,
3. To obey the Scout Law."

The Scout Law :--

1. A Scout's Honour is to be Trusted.
2. A Scout is Loyal to the King-Emperor and to the Maharaja, and to his Officers, and to his Parents, his Country, his Employers, his Comrades and to all others to whom loyalty is due.
3. A Scout is to be Useful and to Help Others.
4. A Scout is a Friend to All, and a Brother to Every Other Scout, no matter to what Social Class, Caste, Race or Religion the Other belongs.
5. A Scout is Courteous.
6. A Scout is a Friend to Animals.
7. A Scout Obeys Orders.
8. A Scout Smiles and Whistles under all difficulties.
9. A Scout is Thrifty.
10. A Scout is Clean in Thought, Desire, Word and Deed.

V. SUBRAHMANYA IYER,
Secretary.

CORRESPONDENCE.

To

The Editor,

Mysore Economic Journal, Bangalore.

Manual Training.

Sir,—No system of modern education can be said to be complete without manual training. It needs no argument to state that there is a pressing necessity for the introduction of a properly organised system of Manual Training into our schools. It is an admitted fact that there is a certain amount of inventive power, to a greater or less degree, in every member of the human race. In the present struggle for existence we cannot afford to neglect it. It has been proved by science that the neglect of a faculty leads to its degeneration and consequently to an inevitable loss of power in that wonderful organism—the brain—which governs that faculty. Manual

Training aims at the development of the powers of reasoning, conceiving, and constructing. It develops all of them not separately but conjointly, and all the three are inseparable. "Construction" without "conception" is naturally limited in its usefulness, and in order to achieve a good result both must be governed by the faculty of reason. Again, conception without construction cannot be of much value. It has been very aptly observed by a modern writer that "Pictures such as the eyes have never rested upon, and machines such as the world has never known may be conceived by the brain, but without the ability to construct without the aid of the hand—such conceptions, however *reasonable* are but fading mirages. But together, *reason*, *conception*, and *construction* can create a lasting, though not a living, object. Together they—the brain and the hand—raise men far above the rest of creation. Together they form the triumph of the Creator's handiwork—the jewel for which the remainder of creation is as a setting. This united action of the brain and the hand, this embodiment of thought which is continually improving the old, and from parts of diverse objects forming new harmonious wholes, we call *invention*; and to it is due that onward march of progress which is so distinctive of the modern world."

Never in the history of the world was this more apparent than it is to-day, and the present epoch of scientific invention has far surpassed the achievements of all previous ages. It may be true that all of us may not be inventors; but in the modern conditions of existence it is imperative that the creative or inventive faculty, which is inherent in every human being, should not be neglected and wasted and that the reasoning, conceiving, and constructing faculties of our children should be systematically and harmoniously developed. Moreover, a comprehensive system so organized as to develop the inventive faculty cannot but inculcate habits of attention, accuracy and observation, and further develop the senses of sight and touch. A system of Manual Training which satisfies these requirements will be an ideal system and it will undoubtedly assure the chances of success of our children.

"In the world's broad field of battle,
In the bivouch of life."

P. MAHADEVAYYA.

A proposed Co-operative Commission.

Sir,—Shakargarh is a singularly unlucky piece of land both as regards the traffic and the character of the land. During a considerable portion of the year it is water confined on all sides. The numerous streams, rivulets, brooks and rivers cut short all means of conveyance. Even bare walking gets intolerably troublesome these days. Gurdaspur, Dera Nanak, Narowal, and Sialkot—the neighbouring markets each stand at a good distance—three over twenty miles and one over sixteen. But the way again is beset with dangers of the water. No less than four streams intervene between Gurdaspur and Shakargarh and about as many between Sialkot and Shakargarh, Narowal and Dera Nanak as well.

Minor Markets are if not equally inaccessible make the journey an arduous task. These natural defects go a long way to tell upon the local Trade. It is slack consequently. In contradistinction to any other section of population concerned therewith, peasantry suffers most. With the peasant the tale of life is well nigh intolerable. His is the business of "much labour and of scanty wages." He is besides proverbially simple and short-sighted and knows little how to economise and curtail his expenses to square with his petty income and to make the best of what he can obtain from his form.

His needs like other men are daily and recurring but his income unlike others is only periodical. How to reconcile this is a difficult problem with him. The moment the farm yields him grain or other commodity, he must willy nilly hasten to one that should convert his produce into money to defray his social domestic expenditures and to pay the revenues—the needs that had long been put off to the harvest time. Himself he can't dispose of his article. Difficulties both natural and artificial stand in the way: markets far off, ways difficult, selling a business long and slow. No contrivance to overcome all, money he must have soon and in cash. Sahukar is the only person that welcomes him and has been doing so in the past as well. He makes the best of the opportunity, gives the money he needs and gets the grain at a rate to be determined sometimes a few months afterwards as his foresight may dictate.

He has his own rate. Sahukari rate—per rupee only two seers more than the market rates. The farmer must succumb to this. A greater portion of his produce is thus disposed of. As regards what is left, there are some minor individual agencies to sponge the fellow-itinerant merchant Bailwalas and others. They manage to secure the grain at a cheaper rate and with a couple of coins given as a

pledge money, sack up the entire quantity of grain, to sell the same in a neighbouring market and with the money thus obtained to pay off the farmer, himself pocketing the profit earned with no capital of his own. The harvest over, the farmer alone finds himself as poor as ever. He toils and troubles days and nights together—at his farm, knowing little what amount of profit that ought to be his own goes to these parasites. The table given below will elucidate the point more fully.

(The figures have been taken from the current rates of Shakargarh and market rates of Gurdaspur.)

Year	Rates at Shakargarh from June to August	Rates at Gurdaspur	Rates at Shakargarh in October & November	Rates at Gurdaspur
	Rs.			
1914	2/10/9 per md	3/3	2/13	3/15
1915	3/1/3 ..	3/12	3/4	4/4
1916	2/14/- ..	3/2	3/-	3/14
1917	3/1/3 ..	3/11	3/4	4/-

The above figures indicate what a good percentage of profit varying from Rs. 25 per cent to 50 per cent (after deduction of conveyance charges) passes to the middlemen simply due to the want of institution on the part of peasants that should atonce undertake the province both of the Sahukar and the Bailwala. Co-operative Societies hitherto have been regarded as money lending (only one aspect of the Sahukar's dealing) and as such they are little likely to promote and advance the interests of the agricultural tribes, against the manifold activities and allurements of the Sahukar, unless and until they should take into their own hands the final sale of the products of the soil to the entire elimination of the middlemen. To me the feasible remedy appears to lie in the establishment at Shakargarh of a Co-operative Store for the sale of agricultural produce, propriated and managed by the Societies directly.

The natural production of the soil under cultivation in this Tahsil seems to favour the idea all the more. The total area of the Tahsil is 311,322 acres, and the area under cultivation is 225,399 acres approximately. From the table given below we gather the average area under wheat cultivation during the past four years has been 78,259 acres per year, excluding 6,165 acres of Kharaba allowed per year on an average. This

means out of twenty-two acres of cultivated area, seven are under wheat. The wheat product during the past three years, of course, does not give a hopeful average, as the harvests have been unusually bad successively throughout the period. But the coming Rabi being extensively sown seems to offer a fairly good prospect. In the light of the table below, the average wheat produce during the past four years, as calculated by the Revenue Department, is nine maunds per acre. Reducing it to six even, as a sure average, the whole wheat production of the Tahsil can be fairly accurately anticipated as 469,554 maunds. This is altogether shared by 746 villages, of which 229 are under co-operation. The co-operative (under wheat cultivation) villages own 19,564 acres producing 117,384 maunds of wheat yearly.

Allowing three-fourths of this total to meet the household necessities of the farmers, 29,000 maunds of wheat worth approximately Rs. 87,000 can be safely contributed to the stock of the Society proposed. Past years did not yield good harvest, so the amount of grain received by the Societies was least encouraging. Besides the general cause there were other patent causes as well to affect badly the recoveries of the Societies. The loss in the bad transactions, ultimately due to the village Kacha Store houses exposed to all kinds of insects, unfavourable rates, and not the least in some cases personal dishonesty of some members of the Committee can be cited as examples of the causes alluded to above.

The Store House at Shakargarh, I presume, will remedy all this.

Year	Area under wheat cultivation	Kharaba	Grain received by Societies	Cost
1914	83,457 acres	5,260	29,470 mds	79,860
1915	92,447 ..	3,846	6,070 mds	18,210
1916	69,424 ..	20,880	2,954 mds	7,600
1917	67,709 ..	13,476	4,742 mds	13,526

Again the existence of this Store will save the contributors the other usual multifarious charges of the mandis which are variously termed as *ahrat*, *dalali*, *tulai*, *rolai*, *shagirdi*, *dharmarth*, educational fund, etc. The realisation of all this will add to the income of the Society. At a trading company at Bhalwal in Shahpur district

such realisation amounts altogether to Rs. 1/5/6 per cent compared to Rs. 2 and 2/4 at other markets. The difference between the two being Rs. 0-10-6 and 0-14-6. In view of the expenses we have to incur, we will not be able to adopt at the outset the Bhalwal rate. What should be the actual charge in all can be determined hereafter when the Store House becomes a certainty. Of course, these charges will form the net income of the Society and after paying off the expenses of the market, the balance will go to the Reserve Fund. The distribution of the profits will take place periodically.

ATTACELLAHKHAN,

Inspector, C. C. S., Shakargarh.

Manufacture of Scientific Apparatus.

Sir,—For the healthy development of our industries, scientific education must be sown broad-cast among the people and that from a practical point of view. Though the study of physical science was introduced in our schools as far back as 1875, it has not become as popular, and has not been of as great use to avail ourselves of the mineral resources and raw products, as it has proved to be in the case of most progressive countries like Japan. The main reason for this drawback in our system of education is that it is wanting in scientific spirit. This spirit can be fostered only when students of science are brought face to face with natural phenomena and are made to study and examine them under varying conditions. The experiments performed by the teachers will not be as effective on the minds of the pupils as those performed by the pupils themselves. The introduction of practical work, therefore, must be made where we now begin the study of science.

Physical science is at present taught in this province from the fourth form, and it is from this class that practical work must also begin. The introduction of this system will mean the provision of adequate apparatus to our High School laboratories, and naturally will involve additional expenditure, but nothing useful can be achieved in the material world without an initial outlay. The result will be so fruitful that in course of time we shall be paid a hundred-fold.

If we properly set to work to achieve this end, we can minimise the effects of increased expenditure to some extent. Much of the apparatus that can be made out of wood, brass, iron and copper, and that does not require fine graduation, can be constructed in our country so that in some way the money spent

will partly at any rate go to promote our industries and give work to our artizans. In the beginning the instruments that will be manufactured here may not attain the same degree of finish as those now imported; but generally high degree of finish and accuracy is not needed in the apparatus used in High Schools. A perusal of the list of apparatus given below will indicate what sort of work it is that our workmen have to do. As experience accumulates and our workmen get practice, accuracy and nicety are bound to follow.

The next question is where are we to get the apparatus constructed. After actual trial, I have thought of placing before the public a plan which can be employed wherever feasible with advantage.

In this State there are a number of industrial schools maintained by the Government and by private bodies, which may be utilised to commence work on a small scale immediately. The advanced students of these schools, *i. e.*, those who have undergone about two or three years' training, will be able to work at the making of these apparatus. This plan was tried in one of the moffusil schools on a very modest scale, and the success attained there was more than one could expect. With less than a year's training, the students with the help of the instructors could work with great dexterity at the designs given, and the apparatus made there could well compare with similar ones of foreign manufacture. If need be, skilled artizans can be employed and made to work under the instructions of the superintendent of such schools.

The success of this scheme will depend upon the active interest and co-operation brought to bear upon it by the science teachers of the High schools, and the Superintendents of the Industrial Schools. The designs for the apparatus required will have to be given by the former and the technical part of the work attended to by the latter. The experience gained by both will be a great asset to the country and it will stimulate a spirit of initiative and originality in our men of science.

Some of the industrial schools, especially those that have been started newly, must be provided with two lathes, one for turning wood and the other for metal, in addition to the ordinary carpentry and smithy tools already existing there. Also the science teachers must be authorised by the Department of Education to spend about Rs. 250 per year per High School towards the construction of scientific apparatus. They should be encouraged in this endeavour by liberal grants of money so long as such grants are usefully spent. Considering that there are only a limited number of High Schools in the State, the total expenditure on this account will not be more than about Rs. 3,000 per

year. Moreover, this work must be regarded as part of the industrial improvement which is so much sought after here at present.

Attempts are now being made in the Industrial Workshop, Bangalore, towards the construction of such apparatus, and there is every hope that the effort made will be a success. In course of time a separate central factory may be started in a convenient place with up-to-date machinery for work of high order of accuracy and finish. With increased experience of our workmen and with labour saving machines of superior type, we are sure to be able to manufacture in course of time cheap and well-made instruments that will stand on a par with the imported ones, if only we begin our work in right earnest now. Then, even the elementary and vernacular schools can be provided with small laboratories consisting of appliances of everyday use, models that can be used with great usefulness in the object lesson classes.

A list of the apparatus that can be easily constructed and which we can take up next year is given below.

1. Inside and outside calipers.
2. Dividers.
3. Beam Compass.
4. Opisometers.
5. Wood and metal cubes, spheres, cylinders, etc., for determination of volume, density, etc.
6. Over-flow jars of double sheet-tin or copper.
7. Cylinder and socket for Archimede's principle.
8. Nicholson's Hydrometer.
9. Burette Stands.
10. Wooden Hydrometers.
11. Steel-springs for Hooke's Law.
12. Pulleys mounted on pivots.
13. Moment bars.
14. Inclined plane with roller, pully and pan.
15. Wheel and axle.
16. Calorimeters.
17. Steam-generators, of double tin.
18. Apparatus for expansion of solids and liquids.
19. Conductivity apparatus.
20. Wooden Optical benches and stands for lenses.
21. Wooden Stands for Tangent galvanometers.
22. Wheatstone's Bridges.
23. Potentiometers.
24. Retort stands with rings and adjustable clamps.
25. Univerral clamps.
26. Table supports, adjustable.
27. Funnel stands.
28. Test-tube stands.
29. Tripod stands.
30. Crucible Tongs.

K. N. KINI, B.A. (Hons.)

Oil of Cardamoms.

Sir,—Under the heading "The Future of Essential Oils in Mysore" Mr. S. G. Sastry contributes to your February number a most interesting article.

I would be obliged if he or any of your readers would kindly let me know :—

1. What are the uses that an essential oil of Cardamoms can be put to such as would make it worth manufacturing in quantity?
2. What in a normal time is the European consumption and the market value of oil?

Mr. Sastry also writes that it would be worth investigating as to the material suitable in Mysore for enfleurage. I believe the seeds of *Sesamum Indicum* will if wetted take up the scent of flowers, and can then be treated by expression. This plant affords a bland oil which should meet requirements.

Saklespur, Hassan Dt. E. W. RUTHERFORD.

Reply to above.

Sir,—In reply to the enquiry by Mr. E. W. Rutherford, of Saklespur, I beg to state that the essential oil of cardamom is used in medicine, in perfumery, and as flavouring material.

The quantity of cardamom exported from India in 1911-12 was 302,552 lbs valued at £ 27,088.

The price of the essential oil of cardamom is at present somewhere in the neighbourhood of 100/- (Rs. 75) per lb.

With regard to the use of *Sesamum Indicum* for purposes of enfleurage, I beg to offer the following remarks:— Even though uncrushed seeds may absorb the odour, the oil expressed out of them afterwards will be found to be contaminated with resinous and colouring matters and other impurities. I think the finest quality of Sesamum oil (white, odourless and tasteless), would lend itself for enfleurage purposes. It should, however, be remembered that sesamum oil cannot replace solid fats that are essential for enfleurage in the case of special odours. Even when sesamum oil is used, care should be taken that the oil circulates well through the flowers so as to extract the maximum odour.

S. G. SASTRY,
Industrial Chemist, Bangalore.

QUERIES.

Hints to Correspondents.

Write on one side of the paper only. (2) Write each query on a separate sheet of paper. This will facilitate answering questions as in many cases they may have to be referred to experts. Put your name and address down on every such sheet. No attention will be paid to unsigned queries. (3) Drawings for illustrations should be on separate sheets of paper. They must be made in black ink only on white paper—not in pencil or colour—and twice the size they are intended to appear, especially reference letters and figures. (4) Put titles to queries, and, when answering queries, put the number as well as the titles of the queries to which the replies refer. (5) No charge is made for inserting letters, queries, or replies. (6) Letters or queries asking for addresses of manufacturers or correspondents, or where tools or other articles can be purchased, or replies giving such information, cannot be inserted except as advertisements. No question is answered through the post. (7) Letters sent by correspondents, under cover to the Editor, are not forwarded and the names of correspondents are not given to inquirers. (8) As the space devoted to queries and replies is limited, they should be drawn up as briefly as possible. (9) To facilitate reference, correspondents, when referring to any letters previously inserted, should mention the number of the letter, as well as the page on which it appears. (10) All communications should be addressed to the Editor, *Mysore Economic Journal*, "Ringwood", Bangalore.

Query 4. In a recent issue of the *Mysore Economic Journal* appeared a note on the manufacture of carbonate of soda from crude 'reh' or 'sajji.' It was stated that some carbonate of soda was already manufactured at Cawnpore Government Laboratory and supplied to glass makers who tried it and found satisfactory.

Will you kindly give me the address of the Government laboratory where it is manufactured and supplied?

Cambay.

C. R. KHAMBATA.

BOOKS IN BRIEF.

National Economy—An Outline of Public Administration.—By Henry Higgs, C. B. Macmillan & Co., Bombay and London. 3s. 6d. net.

Mr. Henry Higgs has added a thoroughly suggestive volume to the many he has already to his credit. In this he has given to the larger public outside the University College, London, the Newmarch lectures delivered in 1916. By "National Economy" Mr. Higgs means nothing more than the wise management by Government of its resources. Mr. Higgs has many pregnant observations to offer on matters of finance, Economical organization, control of Expenditure, Revenue and administration, Budget and the Public Debt. Not only the student of Economics as such but also any one taking an intelligent interest in any one of these subjects will find much to set him thinking in these pages. Here is a passage on Economical administration which is well worth digesting by many a would-be critic of Governments:—

Scientific administration in the sense of a well organized arrangement for adapting means to an end, clearly requires the close collaboration of men of science where the need for scientific expert advice arises. You may muddle along without knowing that you need such advice or you may set up a commission, or call in an expert *ad hoc*. But without a properly organized scientific general staff you are ill-equipped. Is it a question of developing your natural resources, your agriculture, woods and forests, fisheries, mines and quarries, of varying your financial or commercial policy? The accidental piecemeal treatment is a poor second-best. A synthetic programme framed by the expert knowledge of those who are able to take a wide scientific outlook is the first essential. It has been said that a good English lawyer may not know the law, but knows how to find it out. The trained scientist can tell you what it is you ought to know to enable you to deal with your problem, and how, if possible, the knowledge is to be obtained. Examine the lists of officials in various countries and you will find here and there a Government chemist, a Government biologist, a Government entomologist, a Government statistician—nowhere yet, so far as I know, a Government economist. In the main, the lawyer, the doctor, the engineer, and the architect are the only professional officers generally recognised by Governments. For other purposes an official who has picked up his knowledge in the service has usually been considered good enough to carry on. The twentieth century will undoubtedly see a great extension of specialisation in the employment of Government experts.

Under Revenue and administration we would draw the reader's attention to the following words:—

To sum up, without going so far as to say that in revenue matters "whatever is best administered is best", it is important to notice that administrative costs and difficulties play a large part in deciding the merits and demerits of different forms of revenue. A revenue which costs as much to collect as it brings in adds nothing to the resources of Government. The expenditure of part of the wealth of the country in this way (unless it is justified by other than fiscal reasons) merely supports

a parasitic activity. Both on that ground and because of its useless interference with the taxpayer it is contrary to sound economy.

How should a Budget be received? That is an interesting question to discuss. Here is Mr. Higgs' answer:—

Let me add a word as to the spirit in which it should be received. The budget looms very large in sight of the average citizen. Budget night is for him the occasion of a great and interesting speech in the House of Commons, when proposals for new expenditure are justified by disclosing the outline of new policy. But this main interest is centered in the questions, What changes are there to be in taxation? And how will they affect me? Yet a Budget, properly considered, is not a mere matter of how new revenue is to be raised. It is a balance sheet of estimated revenue and expenditure, and "good finance", according to Mr. Gladstone, "consists more in the spending than in the collecting of revenue." Why the revenue received differs from the revenue expected, why the expenditure actually incurred diverges from the estimate, whether the expenditure can be reduced without impairing efficiency are questions of the highest importance. Is an extra penny put on incometax in times of peace? Who knows? Everybody is interested. Can the extra penny be avoided by an economy of two millions? Who knows? And yet, as Mr. Taft says, the question affects the interest of every person living within the jurisdiction of the country. If the evolution of the financial history teaches us anything, it is that the needs of Government have increased, are increasing, and are likely to increase. The problems of the future of growing insistence are how far and in what form are the resources of the country to be absorbed by Government, to what purposes and in what manner can these resources be best applied in the interests of National Economy? The answer will not come from earthworms burrowing in their material with no power of elevating themselves above it, nor from philosophers in the clouds who see the map of the country but are too remote to see its workers. Knowledge of detail must be organized, systematised, shot through the organic filaments of science and philosophy before the constructive intellect is sufficiently illuminated to find or build the most excellent way.

ACKNOWLEDGMENTS.

Names of the Field and Garden Crops grown in the Punjab.—Department of Agriculture, Punjab. Price, As. 2 or 2d.

Madras Agricultural Calendar, 1918-1919.—English Edition. Madras Agricultural Department. Price, 1 anna.

Proceedings of the Third Provincial Co-operative Conference, Bihar and Orissa.—Patna, Superintendent, Government Printing, Bihar and Orissa, 1918. Price, Indian 7 annas. English 7d.

Review of the Foreign Rail-borne trade of the Mysore State for the year 1916-17. By C. Ranganatha Rao Sahib, B.A., B.L., Deputy Director of Commerce and Statistics in Mysore.

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THE REVOLUTION IN EDUCATION: PRESENT DISCONTENTS.

BY M. E. SADLER, C. B.,

*Vice-Chancellor of Leeds University,
Member of the Consultation Committee of
Board of Education.*

AT the present time there are two currents in public feeling about English education.

On the one hand there is a just sense of pride in the rapid development of our secondary schools both for boys and girls, as well as of our Universities and of the institutions which give advanced instruction in science as applied to industries. One has to go back for centuries in our history to find a movement for the extension of opportunities for secondary education comparable in its national significance to that of the last two decades. Warned of her shortcomings in secondary and higher education by Matthew Arnold and Archbishop Temple, as well as by Mr. Balfour, Lord Haldane and Mr. Bryce, England at length set herself to repair this defect in her armour and, with the help of Government and of the local authorities, has accomplished a great deal in a comparatively short time. There is indeed much to be done before we can regard our system of secondary education as satisfactory or our Universities as adequately equipped for the great task

of research. Difficult questions confront us with regard to the due remuneration of the assistant teachers in secondary schools and to the examinations which test the attainments of the pupils. But immense progress has been made in providing new secondary schools and in improving the equipment and buildings of old ones. The Universities, old and new, have been greatly strengthened by the munificence of private benefactors and by grants from public funds. Higher scientific training has become a serious factor in our industrial strength. The whole outlook for secondary and advanced education is brighter than it has been before. To have brought about this far-reaching change in the course of twenty years is an achievement of which the nation may well be proud.

GROUND'S FOR DISAPPOINTMENT—AND FOR GRATITUDE.

On the other hand, there is a feeling of disappointment with some of the results of the elementary schools. Employers complain that boys are not so accurate as boys used to be when education cost less and school-life was shorter. There is also a good deal of concern at the want of sustained interest in serious things which is shown by the great majority of young people who have recently left the elementary schools. Elementary education, on which high hopes were set and for which heavy financial sacrifices have been made, seems to many people to have accomplished much less than was expected of it and, in some way

which they cannot precisely define, to be at fault. But there is also reason for satisfaction with much that the elementary schools have done. The picture is far from being all dark. Careful observers note an increased orderliness in English crowds. There is more self-command, less roughness, a stronger feeling for public order. However much of this is due to a general change in manners, the discipline and influence of the elementary schools must receive great credit for their share in bringing that change about. Again, not a week passes without record in the newspapers of some noble deed of courage or heroism, done without hope of reward but in unflinching and ready obedience to the claims of duty and human brotherhood, by some man or woman obscure in station but quick to respond in the hour of sudden need to a call which may entail injury or death. For this also the nation's gratitude is due in part to the influence of the schools and of devoted teachers working in them. Further the good sense and good temper of the Boy Scouts show what excellent material the elementary schools are turning out, and how ready are great numbers of their former pupils to throw themselves with energy and obedience into an attractive form of self-training and of corporate service. Lastly, there have gone forward from the elementary schools during the last twenty years a large and increasing number of boys and girls who have won distinction at secondary schools and Universities and have proved themselves worthy of high positions of responsibility in different departments of the national life. If we cast up both sides of the account, we realise how great is the debt which England owes to its elementary schools.

WHAT HAS TO BE DONE.

We need, perhaps more than anything else, a new spirit in our elementary schools. They are well-organized, but there is too little originality among them. They need

more freedom—even freedom to make mistakes, freedom to get a more independent life. A school, if it is to do its utmost in forming character, needs to have a character, an individuality, of its own. The teachers, if trusted more and less restricted in their work by regulations, would bring greater freshness and spontaneity into the work of the schools. It is true that we should have to pay a price for this. Things would not go well everywhere; especially at first there would be some confusion and irregularity. But in the long run freedom would bring new life. To make the head teachers of elementary schools freer in the conditions of their work; to throw on them greater individual responsibility for the planning of the course of study and for the methods of school work; to give them freedom in the choosing of their assistants; to entrust to them, in short, powers like those which are enjoyed by the head-masters and head-mistresses of secondary schools would be but to take a step further on the road of liberty in school organization which we have already followed so far with, in the main, good results. With this increased freedom the work of the teacher would become more attractive, because more interesting and responsible. The status of the profession would rise along with an increasing interest among its members in the intellectual and scientific sides of the work of teaching. We should find not only that the teachers ought to be paid more but that to pay them more in return for this finer quality of service would be the most remunerative of public investments. If a new spirit sprang up in the elementary schools, (and there are many signs of this already, especially among the younger teachers who have come out of the training colleges with keen and eager minds), and if, along with this and because of this, parents and employers become more fully aware of the value of the best kinds of school training, it would quickly be found intolerable to put up

with the false economy of the large classes which admittedly make individual teaching almost impossible, although it is well known that in many subjects nothing but individual teaching is of permanent value. To touch the weak spot in English education, we need to encourage a new spirit in the great mass of the elementary schools. Once get that, and there will follow more encouragement of self-training on the part of the children; greater simplification (without narrowness of intellectual outlook) in the course of study; and a steady growth of interest, both among young people and employers in the opportunities offered by continuation schools. I am drawn to the conclusion that the way to get this new spirit is boldly to give more freedom to the teachers, to pay them better and to have smaller classes in the schools.

INCREASED RESPONSIBILITIES.

But what is here proposed is, I admit, not an easy thing for the local authorities to give or for the teachers to use. If the plan were tried it would not mean less responsibility, but a far greater and a more expensive responsibility, both for the teachers and for the administrators. It would mean much harder work for all teachers, especially for the head teachers, because they would be exposed to much more public criticism, and have to deal with demands from the parents which, if reasonable, would tax the energies of the staff and, if unwise, would have to be considerably dealt with and not arbitrarily withstood. It would throw on the local authorities a duty of supervision much more delicate, discriminating and personal than that which is entailed by a more mechanical system of administration. The entrusting to the head teacher the responsibility of choosing his own assistants would complicate the administrative machinery to an extreme degree. The cost of elementary education would be greatly increased both by the raising of the teachers' salaries and by additions to the

teaching staff caused by reduction in the size of classes. And, in spite of all this increased complexity in administration and growth of expenditure, the new system (at first especially) would work badly in a great number of cases. Nevertheless, I believe that it is through this enlarged freedom for the teachers (a freedom which would carry with it a heavy burden of new and difficult responsibility) that the way lies to a true and fundamental reform of our English elementary education. The work, though harder, would be far more interesting, more human, more inspiring; and to a teacher, who cares for his vocation, work (if adequately paid) which gives scope for his best energies is far preferable to work which, though lighter, is monotonous and restricted in the range of its responsibilities. Moreover, in the long run, the whole system of our elementary education would be quickened by new life, and for this, the increased expenditure would be wisely undertaken and ultimately most profitable.

Some interesting figures showing the progress of the jute industry in Bengal are given in a return recently issued by the Department of Statistics. In the quinquennium from 1880 to 1884 there were only 21 mills at work, with an authorised capital of Rs. 270.7 lakhs. They employed 38,800 persons, 5,500 looms, and 88,000 spindles. In the year 1916-17 the number of mills had increased to 74, with a capital of Rs. 1,395.5 lakhs. No less than 262,600 persons were employed, and there were 39,700 looms and 824,300 spindles. The export of gunny bags has risen from an average of 54.9 millions in 1880-84 to 805 millions in 1916-17, and of gunny cloth from 4.4 millions of yards to 1,230.1 millions. The value of the exports has increased from Rs. 124.9 lakhs to Rs. 4,165.5 lakhs. The present output and the value of gunny bags have more than doubled since 1913-14—the pre-war period.

SCIENTIFIC STOCK-BREEDING.

BY PROF. JAMES WILSON

*Of the Royal College of Science, Dublin.**Author of "The Principles of Stock-Breeding," etc.*

IF there is one thing more important than another that could be said to a young stock-breeder it is that he should acquire the habit of doing his own seeing and thinking: that he should accept no man's "facts" without being satisfied that they are facts, and no man's views or theories in explanation of the facts till he has examined them for himself and found them to be sound. If stock-breeders would only modify their attitude towards "authorities" in this direction—towards their grandfathers, their neighbours, and writers in books and papers—they would soon be well on the way towards becoming more efficient in their own profession.

LEARNING AND THINKING.

But our modern methods of education tend all against this. It is all learn, learn, learn, and seldom think, think, think. A boy learns the names of the kings of England, from Alfred onwards, a few important battles and their dates, and the names of a few of our distinguished statesmen and soldiers. But why Alfred and not some other leader? Why William of Orange and not James? Why George the First and not James's son? The educative parts of history are left out. A boy can rattle off the chief towns in Britain and their occupations: Bradford, wool; Manchester, cotton; Belfast, linen; Nottingham, lace; Glasgow, ships; and perhaps Kirkcaldy, floorcloth; and Luton, straw hats. But why Bradford, wool; Manchester, cotton; and Belfast, linen? The bald statement of fact is learned, but other statements that would lead to

questioning and thinking and understanding the facts are left out. The memory part of the mind is exercised, but the thinking part is forgotten.

Schooled in this way, the boy has no thought of questioning the judgments and theories among which he has been reared. Even if he goes to an agricultural college he will be little better, for he will be trained chiefly to recite other people's opinions, instead of being shown how to proceed in order to form opinions of his own. The teacher himself is frequently merely a reciter of what he has been taught, and of what he has read in books which themselves merely recite the opinions their authors have collected from "authorities" whose ideas of the laws of evidence were faulty to an extreme. He will be taught that a long pedigree is the greatest recommendation a breeding animal can have, that a bull whose grandmother was a great milker will get great milking daughters, that tuberculosis is hereditary, that telegony is a real danger, that a deep milking cow must be narrow on the shoulder and wide at the hooks, that the sire stamps the outward and the dam the inward qualities, and so on. Whereas, if he keeps his eyes open and his mind free from bias, he will find that these theories and a great many others are frequently at variance with the facts.

Take, for instance, the very prevalent idea that animals change from generation to generation by imperceptible gradations. According to this idea, the progeny of good stock should be slightly better than their parents. The progeny of two Derby winners, or of two animals descended from Derby winners, should be slightly faster than any previous Derby winner. Yet we know that this is very far from being the case. "Booth" and "Bates" Shorthorns when bred to their own kind only should have been constantly improving. Yet they did not do so. Many indeed improved the wrong way; and then the in-breeding theory

had to be invented to explain why the gradual improvement theory had failed. But the in-breeding theory itself is equally doubtful, as any one who has had to do with wild polygamous animals or with semi-wild animals enclosed in parks can tell.

BUTTER BULLS.

Perhaps an actual case considered in some detail would be more to the point. In a part of the world where butter is of great economic importance, the farmers are very anxious to possess what they call "butter" bulls, that is bulls which are known to have increased the quality of the milk in the herds in which they have been in service. As bulls are frequently sent to the butcher before their daughters come in profit and reveal their sires' qualities, a true butter bull is not very common. One farmer succeeded, however, in getting three such bulls one after another at intervals of several years. The returns from the creamery to which the milk was sent showed it to be gradually improving in quality as more and more daughters of the three bulls came into the milking herd. This was what was expected; but when the details of the improvement came to be looked into, they were found to differ very greatly from what had been expected. It was expected that the daughters of the original cows by one of the new bulls would be a little better than their mothers, and that their daughters again by one of the later new bulls would show a little further improvement still. But it did not happen so. The first bull's daughters were not just a little better than their mothers. Some were no better, others very much better, and the two kinds were about equal in number. The daughters of the second were similar to those of the first: some no better than their mothers, some much better. Half of them gave milk containing about 3.5 per cent of butter fat, the other half milk containing about 4.2 per cent. But when the third bull's daughters,

some of which were out of cows by the first bull, came in profit, the result was still more striking. Some of his daughters gave milk like that of the original cows, some gave milk containing about 4.2 per cent of fat, and one or two gave milk containing nearly 5 per cent of fat. Those that gave 5 per cent milk were daughters of cows which gave 4.2 per cent milk. A point of some importance in the case was that when their ancestry was inquired into, it was found that the dams of the three butter bulls had each given milk containing about 4.2 per cent of butter fat.

There was, however, no gradual improvement among the cows of the herd. The bulk of the milk as a whole showed a gradual improvement; but this was the result of a few individuals improving by sudden jumps of considerable magnitude.

Another farmer in the same part of the world tried to raise the quality of his cows' milk by a somewhat similar method: only he introduced a bull from a strange breed which is known to give milk of high quality. He introduced a Jersey to cross with his ordinary cows. It was expected that the milk of the Jersey bull's daughters would be a little bit richer than that of their mothers, but it turned out to be very much richer—it contained about 4.2 per cent of fat, and that too in the case of every daughter—not half of them but of all. The half-Jersey cows were again mated with another Jersey bull, and the result was that, while half of the daughters gave milk containing 4.2 per cent of fat the other half gave milk containing about 5 per cent. Here again is improvement in jumps: the only difference between the two cases being that, while the first farmer's cows jumped from the first to the second step, the second farmer's jumped from the second to the third.

And so it is with all changes in breeds of animals. They do not come gradually but in jumps. The horns of a breed do not

grow gradually less till the breed is eventually hornless, but they are shorn off by a cross or two with a hornless breed. The scrub cow is not made gradually as good as the Shorthorn, but is made so by two or three crosses with that breed.

From these examples it is clear that a stock-breeder cannot add characters to his stock which they do not already possess without crossing them with other animals which possess the characters desired. If he wishes to breed cows giving five gallons of milk a day, he cannot do so from two gallon cows without crossing them with five gallon bulls or with bulls having the power to raise the cows to the five gallon standard by successive jumps.

MENDEL'S WORK.

One of the greatest discoveries of modern times is that which explains these sudden jumps from parent to child when the parents are unlike. The discoverer was an Austrian monk called Mendel. He dealt with plants, but what he discovered with regard to plants holds good for animals also. Let us take a case which is parallel to that of the cows giving milk of various qualities. In the eighteenth century the foundations of the Shorthorn breed of cattle were laid by crossing a red breed with a white. The result was to produce a new colour—roan—which with the two original colours is still the third Shorthorn colour. There are six different possible matings among these three colours, and the results (per cent) of each mating are as follows:—

	Red	Roan	White
Red x Red gives	100	...	...
White x White gives	...	...	100
Red x White gives	...	100	...
Roan x Roan gives	25	50	25
Roan x Red gives	50	50	...
Roan x White gives	...	100	...

Mendel's explanation of these phenomena is that there are causes or factors, as they are called, for the characters an animal

shows—that is for colour, size, length of limb, shape of body, head, and so on—and that these factors are handed on from the parents to the children generation after generation. There being two parents, the child starts off with two factors—one from each parent. Thus the original red and white ancestors of the Shorthorns had started off, for nobody knows how long, with two factors causing redness on the one hand and two causing whiteness on the other. When, however, these two different races were mated their progeny which, as we know, were roan, had perforce to start off with an unlike pair of factors, one for redness and one for whiteness. See now with which factors the progeny of the roans must start off. The parents offer the factors they have to offer in equal numbers. This can be represented thus:

From one roan parent.	From the other roan parent.
—————R	R —————
—————W	W —————

The young may start off with an R from the left hand parent accompanied by an R or a W from the right hand parent; or they may start off with a W from the left hand parent accompanied by an R or a W from the right hand. Thus, if sufficient progeny are born of roan parents there must be equal numbers starting off with the factors RR, RW, WR, and WW. That is to say: there must be one red to two roans to one white. In the same way, when roans are mated with reds or whites, there must be produced equal numbers of roans and reds on the one hand or whites on the other: RW x RR gives equal numbers of RR (red) and RW (roan); and RW x WW gives equal numbers of WW white and RW (roan).

WHAT THE STOCK-BREEDER SHOULD DO.

Applying this result to the "butter" cattle already referred to we see that, since his daughters from ordinary cows were all medium grade cows as regards the quality of

their milk, the first Jersey bull must have been of the high (5 per cent) grade; and that, since his daughters from these medium grade cows were middle grade and high grade in equal numbers, the second Jersey bull must also have been of the high grade.

On the other hand, the first farmer's three "butter" bulls were all of medium grade. The first two left equal numbers of low and middle grade daughters, while the third left daughters of all three grades—the high grade ones being out of the middle grade daughters of the first bull. He was similar to the roan Shorthorn which is the only kind that can leave all three colours.

What then is the lesson for the stock-breeder in all this? It is perfectly simple and is that if he desires to breed some particular type of animal, he must first of all become possessed of that type. If he can get them pure, like the Jersey bulls, he will attain his end the most quickly. If he can get them only half pure, like the three butter bulls, he will attain his end less quickly, but he will still attain it. The test of an animal's purity or half purity is in the number of animals he breeds like himself.

As there are other kinds of phenomena in stock-breeding cleared up by Mendel's work, and as these cannot be dealt with in a short article like this, it might be suggested that a stock-breeder who wishes to understand his business better than most other stock-breeders should make himself acquainted with this work at the earliest possible moment.

According to the Department of Statistics the total amount of paid up share capital of Joint-stock Companies incorporated in India and registered under the Indian Companies Act (VII of 1913) was Rs. 94 crores at the end of December, 1917, as compared with Rs. 75 crores at the end of June, 1914, or an increase since the war of Rs. 19 crores or 25 per cent.

AGRICULTURE IN THE UNITED PROVINCES, 1916-17.

BY "RUSTICUS."

REPORTS such as that before us show how widespread are the ramifications of the war. The work of Agricultural Departments in India seems, at first sight, to be a branch of activity less likely to be affected by the war than almost any other, but that is very far from being the case. In the first place, many members of the superior staff have been called away to military duty. In the United Provinces, for instance, Dr. Parr, one of the most energetic Deputy Directors, is on active service and has been wounded in Egypt. The Agricultural Department all over India is developing with great rapidity, but it is very difficult to secure suitable candidates for the higher posts while the war is in progress. In the second place, machinery of every kind is scarce and difficult to obtain. This is a serious handicap to the work of the agricultural engineering departments everywhere and even simple implements such as ploughs and harrows are not to be got. In spite of these difficulties and of a year which was extremely unfavourable from an agricultural point of view, the progress recorded in Mr. Hailey's Report is by no means negligible.

The first three crops he mentions, poppy, cotton and indigo, were all crops affected in different ways by the war. As is well-known, the war has revived the demand for natural indigo and in the United Provinces, it proved a serious competition to cotton, 50,000 acres which would ordinarily have been put under cotton being grown with indigo instead. In pre-war days, the United Kingdom looked to Turkey for its supply of opium, the value of which lay in its high morphine content. The war has cut off that

source of supply and British doctors have had to turn their attention elsewhere. Mr. Leake, the Economic Botanist in the United Provinces, in conjunction with Mr. Annett, the Agricultural Chemist to the Government of Bengal, has been engaged on investigations into methods of increasing the morphine content of the opium produced in this country and it is satisfactory to find that they have already achieved results of value, which indicate that, by some alterations in the methods of collection a morphine content fully up to the requirements of the British pharmacopœia can be obtained. Mr. Hailey is of opinion that the full solution of the problem should lead to the development of a valuable industry in the United Provinces.

Cotton suffered more from the bad year than any other crop. Heavy rain throughout the growing period and persistent downpours in September proved disastrous to the yield. In view of the visit of the Cotton Committee to the United Provinces last November, this was especially unfortunate as it prevented any additional light being thrown on the two main problems in regard to cotton growing in the provinces, the possibilities of the extension of the long staple Cawnpore American variety and the prospects of the variety known as K22, which has been evolved by Mr. Leake from the indigenous cotton. K22 is considerably longer in staple than any of its progenitors and would be welcomed by the Cawnpore Mills, if it could be grown in commercial quantities. Trials of American Cotton in the United Provinces date to quite early in the last century but it cannot be said that the problem has even yet been definitely solved. There appears to be a small tract where it can be grown with success, provided an adequate supply of canal water can be secured in the sowing season and provided also that a sufficiently high premium can be obtained to make it worth the cultivator's while to grow it. Arrangements have been made with Irrigation Department in regard

to the first of these essentials. The latter presents more difficulty. One curious result of the reaction in the price of cotton which, after a slump at the beginning of the war, began last year an upward ascent to a height unknown since the American Civil War, was that cultivators who had sown American cotton, sold their produce as *deshi*, in order to save themselves the trouble of handing it over to the Agricultural Department. Only about 150 bales of cotton therefore came into the buying depôts of the Department and this was mostly sold to the Muir Mills, at a premium of Re. 1-4-0 per maund over *deshi*. Considering the inflated price of the latter, Mr. Hailey thinks that this brought in handsome profits to the growers but it hardly seems sufficient to bring about any great extension of the crop.

Sugar-cane fared very little better than cotton and the experimental factory at Nawabgunj designed by Mr. Hulme, the Sugar Engineer, was only able to work for part of the season, the cane crop in the neighbourhood being a thoroughly bad one, and much of the crop brought in being diseased. Mr. Hailey thinks that the factory has not attracted the attention it merits, possibly owing to difficulty of access; but it is obvious that a year like last year was not a good advertisement for it and that it will not be until it gets a good year and a full supply of cane, that its full usefulness will be realized.

In previous reviews of the United Provinces Report, we have mentioned the work on Pusa No. 12 wheat. It is no surprise to find it stated that it has now passed beyond the experimental and demonstrative stage and that the main work in connection with it is the organization of the seed supply over large areas, which is being carried on through the agency of co-operative societies, private farms and seed depôts. Mr. Hailey estimates that the total area under it in 1916-17 could not have fallen short of 100,000 acres and that there will be a large

increase this year as part of the share of the profits of the Government wheat scheme assigned to the United Provinces has been set aside to buy in seed for distribution. Pusa No. 12 is not so successful in the sub-montane districts, where a bearded wheat which does not shed its grain so rapidly is preferred, nor is it apparently altogether suitable for Bundelkhand. Mr. Leake has evolved a type, known as C13, which has strong straw and good milling qualities and seems likely to be a valuable addition to the provincial wheats. The unobtrusive work, which Mr. Leake is doing in evolving superior varieties of cotton and wheat, deserves special mention. Selection, especially in the case of cotton, undoubtedly gives quicker results than hybridization, but those obtained by the latter method, will, in all probability, prove the more important in the end.

We are glad to see that, in the United Provinces, it is fully realized that, to be of use, demonstration must be carried out on cultivators' own plots. A cry is often raised for more Government demonstration farms by those who are ignorant of the fact that the cultivator looks upon the results obtained on such farms with suspicion. Whether rightly or wrongly, he considers that they have been obtained regardless of expense and that the farms have advantages in such matters as water-supply which are denied to him. But if his neighbour carries out improvements suggested by the Agricultural Department and they prove successful, he needs no further convincing. The method followed in the United Provinces in regard to sugar-cane, is to assist the cultivators to grow it on their own land by giving them manure or seed on condition that they undertake to sow and cultivate the land in accordance with the directions given. As Mr. Hailey says, this is the most complete form of demonstration as it comprises preparation of the ground, manuring, irrigation and cultivation of the crop.

One interesting point raised by Mr. Hailey is the stage of development necessary for the establishment of seedmen's business in India. In Europe, the farmer turns naturally to the seed man for his supply of seed. In this country, he seldom bothers about good seed, for, as Mr. Hailey points out, agriculturists have not been educated up to the point of paying more than the food grain rate even for seed which they have good reason to believe to be reliable. They are beginning to wake up in this respect but at present have not got beyond looking to the Agricultural Department to provide them with what they need. The Department is everywhere finding that the distribution of seed takes up more time than it can afford and diverts attention from other important branches of work. But the distribution of good seed is a matter of such paramount importance that we should hesitate to say that the time and trouble devoted to it could have been more profitably spent in other directions. Still it is, undoubtedly, desirable that the Agricultural Department should be relieved of its work in this direction as much as possible and it is satisfactory to know that, in the United Provinces, an increasing share of it is being taken over by Co-operative Societies and private agencies which do not aim at a profit. Many of the large landholders have established farms with the main object of supplying good seed to their tenants. Several Co-operative Societies have undertaken to supply seed to their members, and especially in the Central Circle, are storing the varieties mostly in demand. Only a few of them, however, have been able to undertake the actual buying in of the produce grown from the seed. There is no doubt that co-operative marketing is an advanced form of co-operation. There is equally no doubt that it is a very important form and that, if it became at all general, the problem of securing to the cultivator the true value of his produce, which, at present, he is prevented from obtaining by

the number of middlemen through whose hands it passes, would be successfully solved. In this connection, Mr. Hailey specifically instances the case of cotton, the growers of which are small men who sell their produce in the villages to middlemen and so did not obtain the benefit of the high prices reached last year.

It only remains to make a brief reference to agricultural education. The Cawnpore College, like the colleges elsewhere, seems to have successfully emerged from its bad period, and to have entered upon a career of great usefulness. The total number of students at the end of August in the year under review was 113, of whom 54 were in the collegiate or four year course and 59 in the two year or vernacular course. Both courses were filled without difficulty and there were as many as 146 applications for 25 vacancies in the two years' course. This is especially satisfactory as it shows that there is a demand on the part of the sons of zamindars for practical education in agriculture. It is a very hopeful sign of the times that an important section of the proprietary class is taking a real interest in agriculture as a pursuit. As Mr. Hailey emphasizes, the tangible result has been the establishment on large estates of private farms, of which nowhere are there more in existence than in the United Provinces.

The figures for 1918-19 in Indian Budget show that Rs. 11,28,83,068 were spent on public instruction in India. This amount was divided under different heads as follows: Higher education Rs. 1,07,03,166; Secondary Schools Rs. 3,19,29,182, Primary Education Rs. 2,93,13,545; and special schools Rs. 73,40,926. On Primary education, we find, Madras spent the highest of all, the amount being Rs. 72,13,439. Bombay comes next with Rs. 63,43,589. Then comes Bengal, with Rs. 44,52,425. The Provincial totals of direct expenditure on all branches of education are also interesting. Bengal tops the list with Rs. 1,74,75,149; Madras Rs. 1,53,78,496; Bombay Rs. 1,25,01,142; and the U. P. Rs. 96,30,724.

AGRICULTURAL PROBLEMS OF YEDATORE TALUK.

BY S. SRINIVASAMURTHI, B.A.

OWING to the construction of the Krishnarajasagar Works at Kannambadi in the Mysore District, a large extent of wet, garden and dry lands amounting to nearly 8,000 acres has been brought under submersion in the Taluks of Yedatore, Krishnarajpet and Mysore, and the land compensation scheme sanctioned by Government for settling the displaced population has brought about vast changes in the agricultural conditions of these Taluks. I shall confine my attention to the Yedatore Taluk, as I am personally acquainted with the agricultural conditions prevailing there, having had to do with the land compensation scheme during a period of nearly four years.

As a preliminary to the discussion of the agricultural problems to which the land compensation scheme has given rise, it may not be out of place to give a short outline of the scheme itself. At no time in the annals of Mysore was such a large extent of land brought under water owing to the construction of dams, and consequently there was no occasion to deal with vested interests or to offer compensation to ryots on a large scale. Even the Marikanave Reservoir and the Hesaraghatta Water Works pale into insignificance beside the Krishnarajasagar Dam, at least in point of the private interests affected. When the construction of this Dam was undertaken, it sorely troubled the mind of Government as to how best to compensate the ryots drowned out, as compensation involved a large expenditure of money, and the payment of it might have the effect of severing the agriculturist from his land and turning him adrift so as to become an undesirable citizen of the State.

But the ingenuity of the late Mr. L. Krishna Rao, the then Special Land Acquisition Officer appointed for the purpose, hit upon a plan, whereby both the Government and the ryot could be benefitted.

There was an old project for the excavation of the channel called the Alalkatte Right Bank Channel in the Yedatore Taluk and Mr. Krishna Rao availing himself of this project asked the ryots whether they were agreeable to its execution and whether in case it was taken up and irrigational facilities provided to their lands they were willing to part with the ownership of a third of such land in lieu of the contribution amount payable under the rules. The villagers affected generally agreed to this proposal. Mr. Krishna Rao thereupon submitted a recommendation to Government stating that the channel project referred to above as well as others for the extension of existing channels might be taken up for execution, and that instead of awarding cash compensation to the ryots drowned out, lands might be given to them in exchange out of the lands surrendered by the ryots and the Government *banjar* lands commanded by the above channels. Government approved of these proposals, as they enabled the displaced ryot to settle as an agriculturist again on the one hand and bid fair to bring in an additional income in the shape of assessment to Government on the other. The land compensation scheme outlined above is still being worked out and ought to find a place in the history of the Cauvery Reservoir Works when it comes to be written. In this article I shall propose only to discuss some of the problems to which the sanctioning of the above projects and the working out of the land compensation scheme have given rise.

One of the outstanding features of the Yedatore Taluk is the large area under wet cultivation. This area measured 19,000 acres, and since the excavation of the Alalkatte and the Mandagere channels, some 12,000

acres have been newly added to it. The total area being roughly 31,000 acres, the Taluk stands first in point of wet cultivation. The sudden increase in area under wet cultivation has somewhat disturbed the agricultural situation. Some of the old wet lands have gone down in value owing to irrigation of lands in the vicinity of villages by the new channels. Labour has been disorganized, as a result of which the old wet lands have either been thrown out of cultivation or ceased to yield the original income. These disturbances are of a temporary character and will settle as things adjust themselves to altered conditions. But it remains to be seen whether the extension of wet cultivation in this Taluk will prove an unmixed blessing. It was at one time expected that the grant of lands in exchange to the submerged landholders would attract a large number of settlers. Lands indeed have been allotted to a large number of ryots of Krishnarajapet and Mysore Taluks, but as yet they have shown no tendency to go over to the Yedatore Taluk for purposes of permanent settlement. It may be questioned whether considering the population which number roughly 84,000, the wet area is not too extensive and whether it will conduce to the prosperity of the Taluk in the long run. Where wet cultivation is unduly large, high or intensive farming is not likely to be practised and as the yield from land becomes less and less every year, the investment of money in the purchase of land may prove quite unattractive and unprofitable. This has to be guarded against by the timely importation of labour from abroad.

Owing to the extension of wet cultivation, the lands have been cleared of trees and present a naked appearance. Fuel is one of the necessities of life which the ryot has not hitherto been accustomed to pay for, and he feels in his heart of hearts that increase in wet cultivation is not a panacea for his ills. The scheme of village forests

is still in its infancy and it will take years before it can be expected to bring salvation to the ryot. In the meantime systematic planting of trees in the village topes and the open spaces of the gam-tan or in dry lands has to be encouraged by the free supply of plants and seeds by the Forest Department. In this connection I may state that the present system of getting the avenue trees planted by commercial labour is not working well. When an avenue tree dries up and gets old, the present practice is to put it up for auction, and if any person claims the tree on the score that his father or grandfather planted it, he is told to prove his title thereto and as he generally fails to do so, the tree is auctioned and the amount credited to Government. This has prevented the ryot from attending to the planting up of avenue trees. If permits signed by the Taluk authorities are granted to individual ryots enabling them to take the usufruct of the trees planted by them, there will be some inducement to them and the avenues will also improve to a considerable extent.

It is not necessary to enlarge upon the effects of wet cultivation upon the sanitation of villages. I have referred to this subject in a previous number of this *Journal*. When one visits the village of Katnal, Galigekere, Sakkare or Manchanhalli, one feels tempted to moralise in the words of Goldsmith.—

“Ill fares the land to hastening ills a prey,

Where wealth accumulates and men decay.”

Yedatore Taluk has long been notorious for its unhealthiness and it is a question how far the present extension of wet cultivation will intensify it. Wet cultivation and malaria have been known to go hand in hand, and though steps have been taken to keep a certain area round villages clear of all wet cultivation, still it cannot be said that complete immunity has been conferred upon the people.

Another serious drawback which the increase in wet cultivation has caused to the people of Yedatore Taluk is the conversion of *gomal* land into wet and the absence of land for grazing purposes. This surely will react upon the maintenance of cattle and sheep, where number will have to be considerably reduced owing to lack of fodder facilities. The reduction of live-stock will, in turn, affect the supply of manure. To remedy this state of things, the people should be taught to raise fodder crops for cattle and to make use of green manure for growing wet crops.

From the above it will be seen that provision of irrigation facilities is not always an unmixed blessing and wet cultivation has its own attendant evils—insanitation, inability to maintain live-stock, scarcity of manure and sometimes of fuel. It can scarcely be a matter for congratulation if wealth should accumulate and men decay by one and the same process, *viz.*, increase in wet cultivation. It behoves us, therefore, to remedy the present state of things by the adoption of suitable measures in time. The relation of malaria to wet cultivation is a subject that ought to engage the attention of the Sanitary Department and the Yedatore Taluk offers an excellent field for study and experiment. In view of the large tract of country under irrigation, it may be considered why the ryots of the Taluk should not be encouraged to set apart a portion of their lands for growing sugar-cane. Mere substitution of sugar-cane for paddy will not be of any great advantage, unless the ryots are persuaded to use ground-nut cake as manure and increase the production per unit area. These problems may well call for solution at the hands of the Agricultural Department. The Forest Department should take active steps to promote the planting of trees, etc., by the supply of seeds and seedlings freely to the ryots. If their remedial measures are not adopted *pari passu* with the extension of irrigation

facilities, what was intended for a blessing may prove to be a curse. I write this in view of the fact that high level canals are likely to be excavated from the Krishnarajasagar Dam bringing an extensive area under irrigation. The experience gained in the Yedatore Taluk should serve both as a warning and a stimulus.

In the Yedatore Taluk no attempt has hitherto been made to grow mulberry or to rear cocoons. Its possibilities in this respect have not been investigated. The Department of Agriculture will do well to send a responsible Sericultural Inspector to conduct experiments.

The ryots in this Taluk do not even grow vegetables in sufficient quantities. While every irrigational facility is provided for them, they have confined themselves only to the cultivation of one crop, *viz.*, paddy and have neglected all the rest. Even in the cultivation of paddy, they have not taken to the use of improved agricultural implements. Green manuring is not also practised on a large scale. The valuable areca-nut gardens of Thippur have been submerged by the backing up of water from the Cauvery dam and there is absolutely no likelihood of their growing similar gardens again.

It does one's heart good to dwell upon the landscape when the land is covered with standing crop and the long stretch of emerald green meets the eye wherever it may turn, but a sad feeling comes over one as one contemplates that this fair scene should also carry with it seeds of destruction.

RIVER TRANSPORT OF WOOD AND BAMBOOS IN MYSORE.

BY RAO SAHIB M. RAMA RAO,

Special Officer in Mysore.

OUR State Forests contain almost all kinds of timber woods used in the country and can supply all our wants. Notwithstanding this fact, we annually import foreign timbers to the value of over Rs. 16 lakhs, in addition to sawn materials such as rafters valued at about Rs. 2 lakhs. Even a casual enquiry into the causes of this deplorably un-economic condition of our timber supplies and timber trade will show that our forests are not worked to their fullest capacity owing partly to their inaccessible situation and partly to the inadequacy, inefficiency, and extreme costliness of our existing means of transport—the time-honoured bullock cart which still continues to be the chief if not the only means of transport from the forests to the rail-head or market. The forests of the West Coast, Burma, and Assam, are similarly situated as ours, but yet their timbers are landed in more distant markets than our timbers are, at much cheaper cost, because they are availing themselves of the rivers and other waterways that course down the forest regions to the more thickly populated plains below. Our State Forests are not wanting in rivers which could be similarly utilised, but curiously enough, they have not received in the past that earnest attention which they deserve as a means of cheap transport. A perusal of the old forest records shows that in the past the rivers Thunga, the Bhadra, and the Kabbani which traverse the important timber forests of the Shimoga, Kadur, and Mysore Districts were utilised to a considerable extent for carrying down timber and bamboos much more cheaply than by

bullock carts, and that with adequate trouble and expense in removing rocky obstructions in their beds, they could be rendered still more economical, efficient, and permanent lines of transport. As far back as 1847, Col. Onslow stated in a report to Sir Mark Cubbon thus: 'Vast quantities of various kinds of timbers are yearly carried down the Tunga-Bhadra river to the open country by people who pay a small sum to the farmer of the forests for the privilege of cutting it.'

The cost of carting timber was always heavy and has gradually increased enormously since the river transport was given up. This accounts for our inability to compete with imported timber even in our own markets. Our requirements of timber, firewood and bamboos for domestic and industrial purposes, are increasing very rapidly. We can no longer afford to allow the heavy drain of wealth that our present imports of foreign timber into the country entail, nor can we contemplate with equanimity the still heavier drain that additional imports would involve, to meet our future requirements for industrial purposes, especially when our own forests are capable of producing most, if not all of our wants.

This points to the immediate necessity for our adopting the cheapest possible means of transport from the forests to the markets or rail-heads. Such means may be broadly classed under the two heads of 'Mechanical Contrivances' and 'Waterways.' The former comprise railways, tramways, ropeways, and steam or motor tractors, and the latter comprise the several rivers that flow down the forest regions to the populated plains below.

As regards the mechanical means of transport, we have a large programme of extensions to the existing railways and tramways, but its complete accomplishment will require in the present world conditions some decades and a large sum of money. Even then, it will not help the transport difficulty in the far interior forests which will not be traversed

by the projected programme. In such localities steam or motor tractors cannot possibly be used unless well metalled roads are constructed, but the cost of their construction and maintenance would be prohibitive, apart from the enormous time their construction would require. Wire ropeways are costly and unsuited to the carriage of heavy timber loads over long distances, but they may answer for transport over short distances down hill slopes or across deep gorges or valleys to the road or river side.

Pending construction of the projected Railways and Tramlines, it is well worth considering whether the rivers already mentioned can be immediately utilised for transport of wood and bamboos, and if so, to what extent and under what conditions. For a proper consideration of this subject, it is desirable to examine the past history of the timber floating operations on those rivers, which are still used for the purpose to a small extent.

Of the three rivers, the Bhadra with its tributary Somavahini is likely to play an important part in the supply of firewood and bamboos to the Iron Smelting, and Bamboo-pulp and Paper industries to be established at Benkipur and in the transport of timber of the Ghat Forests to Benkipur Railway Station.

The Bhadra takes its rise in the Tunga-Bhadra Ghat Forest of the Kadur District and flows through that and the South Bhadra Ghat forest and close to numerous other forests situated on either side. Its possible navigable length from Aroli village to Benkipur is ninety-six miles as measured on the topo map. The total fall in level of its bed between the above two places is only 614 ft. representing 6.4 ft. per mile. Except near Kalasa where there is a sudden fall of 109 ft. in a short length of $1\frac{1}{2}$ miles, the fall in level is more or less small and insignificant. Although there are numerous rocky obstructions in its bed, it is only a

few that appear to be really obstructive for timber floating during floods, the rest being submerged. Among the serious obstacles the most important ones are said to be Amba-thirtha rocks near Kalasa, Kudure-abbi below Khandya, Hebbe rocks above the junction of Somavahini and Jakkerigudda rocks. The course and the bed of the river do not appear to have been explored and examined by any competent Forest or Engineering Officer from its upper reaches above Kalasa to Benkipur, but the Jakkerigudda rocks were inspected by Col. Walker and Mr. Pigot—late Conservators, Mr. McHutchin, Superintending Engineer and Mr. B. Subba Rao then Executive Engineer (since retired as Chief Engineer). From the old records it would appear that all the above officers and the late Mr. Ricketts, who was Inspector-General of Forests and who first started the improvement of the river for transport purposes in 1884 by blasting prominent rocks in the Jakkerigudda, were of opinion that the river could be made a cheap and easy means of transport by blasting the rocky obstructions. Between 1884 and 1894, a sum of Rs. 3,792, was spent on rock blasting, but the work was perfunctorily done as reported by Col. Walker after personal inspection. Mr. McHutchin estimated the cost of blasting the obstructing rocks in Jakkerigudda at Rs. 20,000, over a total length of $3\frac{1}{2}$ miles and remarked thus: "If it is necessary to carry on the floating during February or as late as March, I am sure that the expense would be much too great to form the necessary passage, unless the value of the timber, etc., floated down will warrant the outlay." Mr. Pigot after personally inspecting these rocks expressed surprise at the neglect of this important means of transport and said "There is nothing to show that heavy timber (which must be supported by floats such as bamboos) could not, with proper care, be safely rafted down while the river

is at half flood and the rocks entirely submerged. There is also nothing to show that lighter timber such as Teak and Hunal could not be floated at high flood in single logs or scantlings or fuel pieces. From local enquiry, I judged that far more advantage would be taken in Northern India of such a river as the Bhadra." Again he says "When examining the channels it appeared to me that judging from similar blasting operations undertaken in Europe for timber floating purposes, the removal of the obstructions would (unless steps were taken to increase the flow by damming other channels) merely result in lowering the depth of water and thus causing fresh obstructions to arise. I believe that if by an expenditure of Rs. 30,000, an efficient channel for floating at low water or one quarter flood can be secured, the expenditure would be well repaid." On the motion of Mr. Pigot, Mr. Subba Rao, then Executive Engineer, investigated the Jakkerigudda obstructions and submitted a detailed report suggesting that the rocks in the sides projecting into the channel and of the isolated rocks in the channel might be removed and the result seen before taking further action, and that floating of timber might be done in the following floating season and then detailed surveys and sections of portions presenting difficulties might be taken. The then Superintending Engineer (Mr. Whiteley) agreed with Mr. Subba Rao and remarked "but it appears to the undersigned that instead of spending a lot of money on work the effect of which must be uncertain, it may turn out cheaper to build some low dams to hold up water and put 'racas' in them, viz., "lock" it down. The practicability of this will, of course, depend on the fall (general) of the bed and this a long section would decide." The then Chief Engineer agreed in the above views. This was in the year 1899.

The papers were referred to the District Forest Officer, Kadur, for report, after

experimental floating of logs which had been previously ordered. That Officer floated down some logs successfully from Herandur to Lakkavalli through the Jakkerigudda rocks over a distance of eighteen miles. In spite of the rocks the cost of this experimental floating was only 5 annas 8 pies per ton mile—a ton being taken at fifty cubic feet of timber. Even this rate was very heavy for water transport, but still, it compares very favorably with the present carting rates of $9\frac{1}{2}$ annas per ton mile in the Lakkavalli Range and 15 annas in the Hebbe Range. If some of the prominent rocks in the main channel are blasted, and the water in that channel increased by throwing obstructions across the smaller channels, the floating along the main channel would be very much easier and cheaper. From the writer's experience of river transport of timber on the West Coast he feels sure that no costly masonry work is necessary to divert the water from the minor channels to the main one. Even in Jakkerigudda itself he observed a few such channels effectively closed by drift logs and brushwood lying across them and the water turned into the adjoining bigger channels. There is no reason why similar obstructions should not be artificially thrown across gaps in rocks and strengthened by a few large stones being placed there by elephant labor. That this is feasible in most cases is the writer's conviction. The blasting of projecting rocks and isolated boulders in the bed of the main channel is not likely to lower the water level, especially when the water of the minor channels is diverted into it. From the available records it does not appear that any such simple though rough and ready methods of improving the waterway were ever tried.

From the District Forest Officer's description of the trial floating and the behaviour of the obstructions, one feels convinced that the rocks are not so formidable to floating operations as to justify the abandon-

ment of the river as a *line of transport* and that the cost of blasting the rocks would not be prohibitive. That any expenditure incurred in blasting rocks in the main channel and in diverting water of the minor channels into it would be more than repaid within a few years could be easily understood from the great difference between the cost of carting and that of floating as indicated by the figures given above.

Among other notable rocky obstructions in this river, is the one above the junction of Somavahini. Though it is not so formidable as Jakkerigudda, yet there is a fairly large amount of blasting of projecting rocks from the sides of the main channel and isolated rocks in its bed, to be done. The minor channels are not so troublesome and seem to admit of being easily closed in the same manner as suggested for those of Jakkerigudda.

The rocky obstructions known as Kudureabbi and those above Kalasa are said to be serious. The writer has not seen them. They require inspection. Should they admit of being negotiated by blasting and other training operations, it is well worth spending money on the work, as removal of all the major obstacles would enable the transport of the enormous quantities of timbers in the Kadur Ghat forests at a very much cheaper cost than carting.

There are a number of minor rocky barriers along the Bhadra, but they do not seem to interfere with timber floating during floods. If it is desired to continue timber floating beyond January till about the middle of March, these rocks may require blasting, otherwise they need no serious attention.

While recording in the Forest Report of 1900-01 that 312 logs containing 9,176 cu. ft. were floated down the Somavahini and the Bhadra to Lakkavalli, Mr. Pigot says "Floating operations being a new departure in State (*Sic*) the cost of transport by water in this District *decreased by only half an*

anna per cubic foot as compared with that charged by road. But further savings in the cost will be effected hereafter." That 'hereafter' and the construction of low dams across minor channels suggested by an experienced Superintending Engineer and approved by a Chief Engineer remain yet unachieved although eighteen years have elapsed. At that stage Mr. Pigot left the State and the river transport question has practically been lost sight of.

From the foregoing, it is amply proved that the Bhadra and the Somavahini can carry down timber and bamboos much more cheaply than carts can do over a distance of fifty-eight miles from Muthodi to Benkipur. It may be argued that the tramway already existing or under construction from Lakkavalli to Hebbe and proposed Railway from Kemmangundi hillfoot to Benkipur passing Lakkavalli, would dispense with the use of the river for transport. But as against this argument, I would point out that the quantity of timber, bamboos and firewood to be conveyed to Benkipur would most probably exceed the haulage capacity of the tramline, that the cost of river transport would eventually be as low as that of tram-transport, that the river would enable floating of wood from the Ghat forests much higher up Hebbe and that possibly even agricultural produce from tracts on either side of the river may eventually be conveyed by it, that once improved the waterway would be free from the trouble and expense of annual maintenance, and *that timber and bamboos carried by water are improved and seasoned much better than by land route, especially soft ghat woods and bamboos.*

Even if the Lakkavalli-Hebbe tramline is able to haul all the produce of the forests it traverses, thus rendering the use of the river unnecessary from Muthodi side, still the river transport from above Kalasa

up to Hebbe would be indispensable, at any rate, till further extensions of the tramways are accomplished. The timbers of the ghat forests of Tungabhadra and South Bhadra and other forests lower down have to find an outlet, and this river could be rendered an excellent transport line for about forty miles up to Hebbe, probably at a fractional cost of the outlay required for constructing a tramway over that difficult and undulating hilly country. Taking the quantity of firewood to be hauled annually at 50,000 tons from forests on either side of the river, bamboos at 20,000 tons and timber at about 5,000 tons, only, the tramline will have to carry about 210 tons daily. Whether this would be possible all the year round is a matter to be considered. Even if it were, it seems to be safer to have two strings to our bow, especially when the cost of the extra string may not exceed one or two lakhs of rupees.

Taking the transport of bamboos alone, their conveyance by water will be much cheaper and easier than by carts or even by tramlines, and will ensure their preservation in a green condition which is more suitable for pulping than when they are dry. Assuming that only 20,000 tons of bamboos would be carried to Benkipur from the forests on either side of the Bhadra and Somavahini, timber and firewood being carried by tramline, the saving in the cost of transport would be more than Rs. 25,000 annually, even if that saving were only $\frac{1}{2}$ anna per cu. ft. or Re. 1-9-0 per ton for thirty-eight miles—the average distance to Benkipur from the forests as against $\frac{1}{2}$ anna for eighteen miles saved on timber in 1900-01. This saving leaves ample margin for interest on the outlay at 5 per cent and of a large amount annually towards recovery of the original outlay. From a financial point of view also, the outlay on the improvement of the navigability of the river will be a very profitable concern.

From the foregoing facts, it is clear that the Bhadra with its tributary Somavahini is a suitable, efficient and profitable means of transport of our bulky forest produce over a distance of about ninety-six miles, and that the question of its utilisation is of the utmost importance and urgency. What is immediately required is a thorough exploration and study of the course of the river from Aroli beyond Kalasa to Benkipur by a competent Engineer associated with a Forest Officer, and submission by him of a practical scheme for rendering the river freely navigable for timber and bamboo rafts. This preliminary investigation and preparation of a practical scheme may cost about Rs. 8,000 and occupy about six months' time of an energetic and experienced Engineer assisted by a small staff of men. From what I have seen of the course of Bhadra and Somavahini, and some of the rocky barriers in it, I have no doubt in my own mind that they are capable of being rendered easy and cheap transport lines at a moderate cost and that any investment on the work would be a sound and profitable business proposition.

The next river of importance from a transport point of view is the Tunga. It takes its rise in the Narasimhaparvata ghat forest and flows through it and along the Tungabhadra ghat forest. Its total length from Gulaganjmane village where its tributary the Vimala joins it and wherefrom it is reported to be navigable to Shimoga, is eighty-five miles on the map. The difference in the level of its bed between Shirilu about $4\frac{1}{2}$ miles higher up Gulaganjmane and Shimoga is only 389 ft. in a total distance of about ninety miles, and the average fall is therefore only 4.3 ft. per mile. The highest fall per mile is 19.3 ft. between Shirilu and Gulaganjmane, the next being 10.4 ft. between the latter and Tanikod and the third being 8.8 ft. between Tanikod and Sringeri. Thence for about thirty miles up to Thirthahalli, the bed is practically level with

an insignificant fall. Between Malatihole and Thirthahalli temple, the fall is 7.1 ft. per mile and thereafter up till Shimoga it is comparatively small.

It appears from the latest reports of the local Revenue officials that timber and bamboos are floated by local ryots from Gulaganjmane to Sringeri and that though there are some rocks in the river, they do not seriously hinder timber floating in flood seasons. There are said to be two serious obstructions, one known as Bheemana Katte about three miles higher up Thirthahalli and the other at the latter place. So far back as 1801, Buchanan mentions in his *Record of Travels in Mysore* that this river could be used for transporting timber, and Colonel Onslow reported in 1847 that timber and bamboos were regularly carried down the river from near Thirthahalli to Harihar and further beyond. In spite of these records, there is nothing in our forest literature to show that the Forest Department ever investigated the possibility of utilising the river to its fullest extent for tapping the rich ghat forests, through which it flows. From the Forest Annual Reports we observe that between the years 1896 and 1903 considerable quantities of timber and bamboos were transported along the river. From other Forest records it is gathered that owing to the scarcity of professional timber-floaters and their inordinate rapacity, the use of the river for transport purposes has gradually been given up as was the case with the Bhadra also. Now that the demand for timbers of all kinds has become so keen and will grow keener still for meeting our own industrial needs and for probable export to Europe where the present world war has practically destroyed the timber resources of that Continent, we can no longer neglect to make the most of this river as a transport line. It will be a long while before we construct the full length of Railways or Tramways required to tap our Ghat forest resources. When we

have this excellent water-way to serve us almost immediately at a much smaller expenditure of money and labour, there seems to be no justification to neglect it any longer.

What is required is to set immediately a competent Engineer to explore the course of the river from its upper reaches above Gulaganjimane to Shimoga and to prepare a scheme for removing the rocky obstructions and rendering the river more easily navigable during the monsoons. What this work will cost it is not easy to estimate now, but it may be safely asserted that it will be very much less than that required for the improvement of the Bhadra, there being fewer and less formidable rocks in the course of the Tunga.

The Kabbani, a tributary of the Kaveri, traverses the richest forests of the Heggaddevankote Taluk in the Mysore District and connects them with the Railway at Nanjangud. Its total length from Bavali on the Malabar Frontier to Nanjangud is about eighty-five miles and is throughout suitable for timber and bamboo transport. Till a few years ago it was largely used for rafting timber from Malabar and Mysore forests and is still being so used to a smaller extent up to Homergalli above Rampur anicut, by the Malabar timber traders. Its utility as a cheap transport line attracted the attention of the late Mr. Ricketts in 1890 and at his instance a wier on the bank of the Hulhalli channel was constructed at a cost of Rs. 16,000, for floating timber along the channel. Timber and bamboos from the forests of Kakankote, Begur, and Ainur-marigudi were annually carried down the river till 1907 when the Hulhalli channel was closed to timber transport on the complaints of the Revenue and Public Works Departments. On a strong representation made by the Conservator of Forests in 1912 for the reopening of the channel, Government ordered that a joint workable scheme for floating timber down the river and the Hulhalli channel should be

submitted by the Forest and Engineering Departments, and accordingly the Chief Engineer prepared a project for constructing a masonry lock at the Hulhalli wier at a cost of Rs. 30,140 in April, 1916 (nearly four years after Government ordered it), but the Conservator returned it stating that since a tram-line from Mysore to Kakankote was under contemplation, the project of the masonry lock might be kept in abeyance. There the matter stands.

Since 1907 almost all the forest timber, firewood, and bamboos of the above forests are transported by carts. We find from the Working Plan of the Heggaddevankote forests that in 1908 the cost of carting was six annas per ton-mile, whereas carting from forests to river bank and then floating to Hulhalli channel head and thence carting to Nanjangud cost only four annas per ton-mile. It may, in passing, be here mentioned that the present carting rate is six-and-a-half annas per ton-mile from forests to Mysore, showing a rise of six pies since 1908, and even at that rate, sufficient number of carts are not forthcoming for transporting the full output of the forests, which are not therefore worked to their maximum capacity. The average total distance by land route being fifty miles and that by the river sixty miles, the cost of carting a ton to Nanjangud amounted to Rs. 18-12-0, whereas partly carting and partly floating by river cost only Rs. 15, leaving a saving of Rs. 3-12-0 on every ton. If a masonry lock had been constructed for the Hulhalli channel bank, so as to allow uninterrupted floating of the produce, there would have been a further saving of six pies per cu. ft. or Rs. 1-9-0 per ton between Hulhalli and Nanjangud, thus bringing the total saving to Rs. 5-4-0 per ton from the forests to Nanjangud. According to the sanctioned Working Plan, the total annual quantity exploitable is 1,30,000 cu. ft. or 2,600 tons of timber alone and about 5 lakhs or 1,000 tons of bamboos. If all these quantities were transported by the river, the total annual saving

would be Rs. 27,000 which represents the gross saving on the outlay of Rs. 30,000 on the construction of the 'Masonry Lock.' Deducting 5 per cent for interest on the outlay and 5 per cent for depreciation of the masonry lock annually, there will still remain a net annual saving of Rs. 24,000 on timber and bamboos alone. If firewood is also transported by the river as it will doubtless be when uninterrupted floating from the river bank in the forest to Nanjangud is assured, we may safely take 20,000 tons of firewood as the minimum annual quantity that could be transported. The saving on this quantity at three annas on every ton will be Rs. 3,750, thus showing a total net annual saving of Rs. 27,750.

It may be argued that Nanjangud is not a brisk market for the above quantities of timber, bamboos and firewood and that they will have to be transported to Mysore. This objection, if found valid, can be easily satisfied by employing a mechanical contrivance for hauling the produce up the river bank and conveying it by a Railway siding to the main line and on to Mysore. The cost of construction of these works may not exceed Rs. 10,000 at the outside: allowing interest and depreciation on this sum at 10 per cent and Railway freight at 2.7 pies per ton-mile and terminal charges of Rs. 1-8 0 per truck of 6 tons, the total charges of railing the whole quantity will amount to Rs. 11,000. Deducting this sum from the net saving of Rs. 27,750 there will still remain a profit in round figures of Rs. 16,000 annually in favor of river transport. These considerations show that if the 'masonry lock' had been constructed in 1913 and the carting of forest produce replaced by river transport, the whole outlay could have been recovered *twice* over by the end of 1917.

The contemplated Railway or Tramway from Nanjangud to Kankankote which is understood to have been since sanctioned, does not detract from the utility of the 'masonry lock' in the Hulhalli channel bank.

This work being a small one may be completed in a few months, and the river used for floating forest produce until at least the construction of the Railway is accomplished. This may take some years, during which the cost of the masonry lock may be fully recovered. Even after the Railway is completed, the river may be found useful for the conveyance of surplus produce or to relieve the congestion of traffic on the Railway during the monsoons. By the use of the water-way for timber traffic, the strain of wear and tear on the Mysore-Kankankote road would be considerably relieved and its annual maintenance cost may also be appreciably reduced.

In the foregoing brief account of the three rivers, I have not enlarged upon the inadequacy and inefficiency of the local supply of professional raftsmen, and their limitless rapacity. From old forest records, it is gathered that the few *bestars* who are the chief if not the only class of raftsmen available, are unscrupulous in their demand of rafting charges, and that it was owing to their scarcity and rapacity that water transport of timber has gradually been given up. The *bestar* population in the riverain tracts is comparatively very small and they are also petty cultivators of land. With a view to charge exorbitant rates for rafting forest produce, they exaggerate the formidableness and dangers of the rocky obstructions in the rivers Tunga and Bhadra. I have reason to believe that the obstructions in these rivers are no more formidable than those found in some of the rivers on the West Coast such as the Periyar, the Pam-bayar, and the Chalakudi, all of which are largely used for timber transport. Our local professional raftsmen being comparatively few and their charges for floating timber, etc., exasperatingly high, it is absolutely necessary to organize and import experienced and skilled raftsmen from the West Coast to conduct floating operations on our rivers on a large scale and to

gradually wean our local men of their unreasonable attitude and inordinate rapacity.

Besides the above rivers, there are others which may be found to be serviceable as cheap transport lines from remote and interior forests, where cart-transport is difficult and costly. Among such rivers may be mentioned the Nugu in the Mysore District, and the Hemavati and Kempuhole in the Hassan District.

The Nugu is a tributary of the Kabbani and flows along the southern and western limits of the Berambadi State Forest and between it and Ainur-marigudi forest and joins the Kabbani south of Hampapur. Its total length in the Mysore State is thirty-eight miles, of which for fourteen miles it traverses the above forests. The Forest Annual Reports make no mention of its use for floating timber, but the Heggaddevankote Working Plan states that with some improvements it could be used. There are two anicuts across it, which the Executive Engineer of Mysore Division says require each a 'masonry lock' at a cost of Rs. 30,000, for passing timber rafts through. The utility of this river for transport purposes and the economic aspect of spending Rs. 60,000 for constructing masonry locks or of stationing elephants at the anicuts during flood seasons to drag the timbers across the dams and refloating them require local investigation and careful consideration of the financial aspect of floating forest produce as against carting it.

The Hemavati taps the rich and almost untouched Ghat Forests of Belavathhalli and Hagare in the Manjarabad Taluk of the Hassan District. Writing in 1897, Col. Walker says "The Hemavati river holds out hopes for export of timber from Manjarabad to Hole-Narasipur and Channarayapatna." Mr. Pigot wrote in the following year thus: "The possibility of exploiting the magnificent Ghat Forests of the Hassan District by using the Hemavati river as a means of trans

port to the riverain *maidan* taluks where timber commands a high price was also considered." In the 1902-03 Forest Report, Mr. Muthannah alluded to the failure of an experimental floating of bamboos owing to high floods and promised to repeat the experiment in the following year, but no mention is made of it in the reports of subsequent years. This river is deserving of more attention than it has received as a possible means of cheap transport from the unworked Ghat Forests of Manjarabad.

The Kempu-hole flows westwards from the Manjarabad Ghats to the Coast. In his Annual Report for 1896-97, Col. Walker says "The Kempuhole river in the same District may perhaps also be used for floating timber and boats from Ghat Forests to South Canara provided we get purchasers from that place". There is no mention of it in the subsequent forest reports or other records. This river may come in handy as a cheap transport line for working the Ghat Forests profitably and supplying the South Canara District with timber and sleepers or for exporting the timber to European Countries, where a keen demand for every kind of wood will arise on the restoration of peace.

Besides the rivers dealt with above, there are a number of their tributary streams large enough for timber-transport to the main rivers, either by direct floating when there is sufficient water or by dragging by elephants or other animal power in shallow water. Such streams are used largely on the Malabar Coast where the operation of dragging logs by animal power in shallow water is known as '*Chalpani*.' There is no reason why similar means should not be adopted in our forests, thereby saving heavy cost of making temporary roads in hilly tracts for carting timber at a prohibitive rate.

The main object of this article is to draw pointed attention to the cheap transport

facilities that our river systems afford to the important timber forests of the State. I am as much surprised now as Mr. Pigot was in 1899 at our neglect to utilize them to their fullest extent. Among the rivers noticed above, I would specially emphasise the importance of the rivers Tunga and Bhadra as the cheapest outlets for the produce of our richest Ghat Forests, which still remain practically unworked owing to their remote and inaccessible situation. A few rocky obstructions in their course ought not to have deterred us from utilising them for transporting purposes. Our wants of timber and other forest produce have already increased so largely as to necessitate an annual drain of Rs. 18 lakhs in importing foreign timber. Our future wants for industrial and domestic purposes will be very much greater. To cope with this ever increasing want, we must conserve and develop our forest resources and tap them to their fullest capacity. To do so, these rivers must be utilised for transport purposes to a larger extent and over greater length of their courses than was ever done before by improving their water-ways and removing the rocks that obstruct the passage of timber rafts. What expenditure such improvements would require cannot be stated with certainty until a competent Engineer explores their courses and prepares a detailed scheme. It is my humble opinion that any expenditure incurred on their improvement will be very much less than the construction of tram-lines or even efficient roads and their annual maintenance. The subject is worthy of serious consideration and early deputation of an expert Engineer to investigate and report upon its practical utility and possible cost. The cost of this proposed preliminary investigation would be a trifle compared with the beneficial results it might lead to.

INDIAN SUGAR-CANE INDUSTRY.*

BY C. A. BARBER, Sc.D., F.L.S.

THERE is a marked shortage in the supply of sugar all the world over. This appears to me to be due to two main causes. In the first place, there is a rapidly increasing consumption *per capita* in all countries, and secondly, the huge supplies of beet sugar, hitherto exported from Germany, Austria and France, have been entirely cut off by the war. The world's pre-war consumption was about 18,000,000 tons yearly, and beet and sugar-cane were credited with about 9,000,000 tons each. The price of sugar is at present extremely high, and I regard as probable that the longer the war lasts, the higher will it rise.

India has, as is well known, imported increasing quantities of sugar during recent years, the annual total reaching not far short of a million tons. This imported sugar used to come largely from Austria; more recently Mauritius entered the market, but at present it comes almost exclusively from Java. The World's shortage has made itself felt in India in that the retail price has nearly doubled. Can India, taking advantage of this, produce this sugar herself? Can she indeed look forward in the future to becoming an exporting country, as she once was?

There are two basal factors to be considered before approaching this question. We do not know whether this rise in price will be more or less permanent or whether, after the war, it will sink again to its former low level, and it is not an easy matter to start a sugar factory, and several years must elapse before the solid foundations of such an enterprise can be laid. Sugar-making in

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India must be considered to a large extent as a new industrial enterprise, and the difficulties in the way are much greater here than in any tropical country where the cane is grown. A vital question is the price of sugar after the war. I have formed the opinion that it will take many years before it sinks to pre-war level, if it ever does. And I base this opinion on the following facts and considerations :—

- (1) There is a constantly increasing consumption of sugar in all countries, and one effect of the war will be, I think, to give an impetus to this. I regard this increase as a permanent feature for many years to come.
- (2) It seems probable that the British Government will take some steps to prevent the free dumping of sugar on the market by countries at present at war with us, and this will inevitably lead to an enhancement of the price.
- (3) There is a considerable dislocation in the beet-growing area in Europe, because the war has selected for its activities the particular area where beet is grown, and there has been a great and calculated destruction of property there. There will thus be less total sugar available. There is considerable shortage, even in Germany, in spite of the cutting off of the whole of her export trade, and one of the lessons of the war will, I believe, be that it will be considered economical for much more sugar to be retained for internal consumption, both by man and beast, than was formerly done in all beet-growing countries.
- (4) With one exception of importance, to be noted below, I do not apprehend any immediate great

extension of sugar-cane tracts in the tropics. The following is, according to my idea, the position of affairs. There are a very great number of countries in which the sugar-cane is grown, and great strides have been made, both in field and factory, during the last twenty years of agricultural revival. It does not seem likely that further improvements or extensions will be more than sufficient to keep pace with the normal increasing demand, with one possible exception. For the sake of brevity, I will merely consider Java and Cuba, easily the greatest producers at the present time. There are many reasons for thinking that Java has nearly reached the limits of its production, as the past few years, in spite of strenuous scientific control, have shown decreased outturn on the estates, and it is generally conceded that practically all the good sugar-cane land has already been taken up. With Cuba it is different. It is a great unknown factor. But there are interesting figures available which show that this country is worthy of special attention. It is, indeed, quite within the bounds of possibility that, in the near future, it may dominate the sugar position much as Brazil has done that of coffee. It has not, moreover, as yet been possible or necessary to bring to bear on it the laborious scientific work, which has characterized the industry in Java, Mauritius, the West Indies, Louisiana, Hawaii and other places. It will be seen from the following figures that there is a

great future in store for the Cuban sugar-cane crop.

Before the war of 1898, Cuba's sugar production had reached 1,000,000 tons a year.

	tons.
1897-1900 . .	200,000 to 300,000
1901-1903 . .	600,000 to 1,000,000
1904-1912 . .	1,000,000 to 2,000,000
1913-1916 . .	2,000,000 to 3,000,000

It is considered by some that the output this year may reach 3,500,000 tons. There are, I believe, great areas of rich land at present unworked, and capital and machinery are pouring into the country. There is little doubt that an important factor is thus introduced, which may have great influence on the future price of sugar.

THE DIFFICULTIES IN INDIA.

(1) *The class of canes grown in India.*—

Roughly speaking, there are two great sugar-cane tracts in India, which differ fundamentally. The first is that in which thick tropical canes can be grown to maturity, often as well as in Java or the West Indies, the second is entirely given up to thin, hardy, fibrous, indigenous varieties generally unsuited for the economic production of sugar.

The first region consists of the Peninsula (Madras, Mysore, the lower parts of Bombay and the Central Provinces) and, curiously enough, Assam and Burma (1917). This is the natural sugar-cane tract and is, in the main, in the tropics. The inclusion of Assam is due to its moist, equable climate, in which it resembles, perhaps more than any other part of India, the cane conditions of such a tropical island as Antigua.

The second region is extra-tropical. Bengal and Bihar may be regarded as transitional, but, after passing the Rajamahall range of hills, a great change is noticeable in the character of the flora and the crops grown. We soon enter the wheat region, as contrasted with that of sugar-cane. This region includes the alluvial plains of the Ganges and Indus and extends into the

north of the Central Provinces and probably of Bombay.

Now it is a curious fact, and a constant source of mystification to those not conversant with Indian conditions, that the acreage under cane in the sugar-cane tract is comparatively insignificant, and at least 90 per cent of it is to be found in what I have summarily termed the wheat tract. This is one fundamental difficulty in any extension of sugar-making in India. I am not prepared to discuss its causes in detail here, but would merely suggest that, in the past, with comparative lack of communications, and the presence of hardy indigenous kinds, the need of sugar or its equivalent *gur* caused the sugar-cane to become an integral part of the cultivation in North India, whereas the smaller populations of the south were more accessible from outside and had other sources of supply in their palm forests. Furthermore, irrigation was necessary there and the expenses generally of cultivating the thick tropical canes were out of all proportion greater than those of the northern kinds, and this undoubtedly checked expansion in the south.

(2) *Competition with gur.*—Besides the unsuitable character of the canes grown, a second difficulty in the way of extension in the way of sugar-making in India is the fact that, beyond the importation referred to above, sugar is not an essential food of the people. They prefer jaggery or *gur*, an extremely impure form of sugar, which cannot, as a rule, be economically used as a raw material for sugar-making. The great mass of the sugar-cane grown in the country is used in the preparation of this commodity. The price is comparatively unaffected by the fluctuations in the world's sugar market and the chief factors influencing the extension of cane cultivation are the general increase in population and the rise in the scale of living, the character of the season and the prices of such other staples as are grown interchangeably with it. The relative

profitableness of the conversion of the cane juice into *gur* and sugar has therefore to be considered in each tract before any decision can be reached as to the possibility of founding a sugar factory there. I am not in a position to discuss this question in its commercial aspects, but would merely draw attention to the fact that the contest between the two products is very unequal. *Gur*-making can be conducted by any one who has the canes growing, accurate tests regarding ripeness are unnecessary, no capital is required and the practice can be discontinued without loss. Sugar-making is a new enterprise in India, requires large capital and the difficult combination of many growers, can only be instituted after considerable preparation and cannot be discontinued without serious financial loss.

(3) *Subdivision of the land*—These difficulties are emphasized by the opinion, general in sugar-making countries, that for commercial success, the enterprise should be carried on on as large a scale as possible. A large block of land is needed, so compact as to reduce the heavy carting charges to a minimum and the factory should have control over the fields so that it is kept constantly and evenly supplied with the canes. In the settled parts of the country, the holdings are small, and such sugar-cane as is grown is in scattered plots of small size. It is impossible to alienate the land for an enterprise of this kind, and it is difficult for any control to be exercised by the factory. This is a very important difficulty and practically rules out large areas in the sugar-cane tract from the possibility of sugar-making.

(4) *Competition with other crops*.—The whole question of obtaining lands for sugar-cane growing will ultimately depend on the relative profitableness of the crops now being grown. This will be referred to later, but it should be stated here that this rivalry varies with the tract, paddy being a serious rival in the irrigated parts of the Peninsula

and in parts of Bengal, jute being the main rival in the sugar-cane land of Bengal and cotton in the canal tracts of the Punjab. These crops are not likely to be displaced and the extension of sugar-cane in such areas is therefore unlikely.

Summarizing, the extension of sugar-making in India is handicapped by the extremely poor character of the canes grown, by the unequal competition of *gur* where it has a steady and satisfactory market, by the relative cost of initiating *gur* and sugar-making, by the extreme sub-division of the land which renders it impossible to work a factory economically, and by the competition of crops already on the land and which can be easily and profitably grown. We must turn to places where the price of *gur* is low, where the land is not fully settled and where it is possible to introduce a better class of cane varieties.

PROSPECTS IN THE DIFFERENT PROVINCES.

I propose now briefly to pass under review the various tracts in India where sugar-cane is grown, in order to emphasize the fact that each has its own peculiar difficulties and incidentally to see in which directions progress is more likely to be effected.

Madras can grow sugar-cane as well as any average place in the tropics. It, however, requires irrigation, and thus comes into competition with irrigated crops, mainly paddy. The latter crop is perhaps the easiest to grow in India, while sugar-cane is one of the most laborious and the most difficult. With present prices of paddy and the possibility of growing more than one crop in the year, it is not likely that sugar-cane will to any large extent replace it, even under favourable conditions. Where, however, large quantities of subterranean water are available, paddy competition is ruled out and the matter is less complicated, in that garden crops (those irrigated from wells) also require a good deal of labour. *Ragi* (*Eleusine*

coracana), groundnut, *cholan* (*Andropogon Sorghum*) may be regarded as typical of these. These are the new competitors, and the sugar-cane has a better chance, especially as the individual fields are larger. As an example of successful work in sugar-making in such a tract, I would refer to the sugar factory at Nellikuppam in South Arcot. Here, with a better class of cane introduced by the work of the Samalkota Government Farm, with large stores of subterranean water and an easily workable soil, sugar-cane cultivation has made great strides. By suitable advances, the distribution of manure and the abundant supply of water by powerful engines, it has been found possible to induce the ryots to grow large fields of sugar-cane and bring the canes to the factory. But such areas are rare indeed in Madras, and it has always seemed to me as if a bit of the alluvial plain of the Ganges had been here inserted between the hard red, and stiff clay soils of the Peninsula. The tract is, in fact, composed of the alluvium of two rivers, the Cadilam and Ponnai and is the centre of the groundnut cultivation in India. From what I know of the conditions prevailing in other parts of the Madras Presidency I do not consider it likely that any great extension of the sugar-cane cultivation will take place, and the foundation of many sugar factories appears to be less likely still. I have dealt with Madras rather fully because it can grow such good thick canes, and this fact is constantly laid hold of by those who wish to extend sugar-making in India.

Mysore.—I am not very conversant with the conditions in Mysore, but a good deal of sugar-cane is grown there. It is not a paddy country and the population is comparatively sparse. The rainfall is not great and irrigation is necessary. With the extension of irrigation projects or the discovery of subterranean water supplies, it is not inconceivable that sugar factories may be started, but I would defer to the opinion

of the Director of Industries, who has, I believe, made a special study of the question.

Bombay.—Here the problem is again entirely different. The competition of paddy is removed. Excellent cane crops are raised on the rich volcanic soils, and the juice is very rich in sucrose. Yet the area under sugar-cane is insignificant. New irrigation projects are nearing completion in unoccupied tracts, and it is expected that a large part of these will be planted with sugar-cane. Whether this is utilized for *gur* or sugar-making, will presumably depend on the prices ruling, but it should not be difficult to obtain large compact blocks if the latter is decided on and the capital is available.

The Central Provinces.—These are on the line of demarcation between the two great sugar-cane tracts in India, and excellent crops of thick canes can be grown in the southern part of the area. The population is sparse and there is a considerable development taking place in opening up new irrigation works, by which considerable areas will be available for sugar-cane growing. There is indeed reasonable hope that a great deal more sugar-cane will be grown in the near future. But the amount grown is at present extremely small, the price of *gur* is very high and the local Agricultural Department do not consider that sugar manufacture can be undertaken on the new land in competition with *gur*.

Bengal is a great paddy-growing country, but this is chiefly in low-lying land unsuited for sugar-cane. The higher land, with sufficient water to do without irrigation, is, however, fully occupied by jute, which has nothing to fear from competition with sugar-cane. Good thick canes can be grown in many parts, but in spite of this, the varieties are, on the whole, exceedingly poor and primitive. There is undoubtedly room for considerable improvement here, but the Agricultural Department is under special difficulties in Bengal. The population is very dense and I do not think it likely that

large blocks will be available for sugar-cane growing, even with improved varieties.

Assam.—The unique geographical conditions of Assam have already been referred to. The population is very sparse and there are large unoccupied areas in Lower Assam on both sides of the Brahmaputra. The unhealthiness of the country has, I believe, improved of late years and there is some likelihood of the increasing masses of Bengal pushing their way into the Assam valley. An experiment on a large scale has been made by Government, to see if these great unoccupied areas can be utilized for the growing of sugar-cane. The first stage in this experiment has now been reached, and it is evident that, with certain precautions, thick canes can be grown with great ease over large areas of the grass land in Kamrup. There are special difficulties in the way, such as control of surface water, absence of communications and scarcity of labour which has to be introduced, but these are to all appearance being successfully overcome, and the prospect is distinctly encouraging. There is a very large amount of land of a nature similar to that on which the farm is placed. The local price of *gur* is, I believe, high, but the demand is not excessive, and it seems more probable that the limiting factor will be the prices ruling in the great Bengal market.

Bihar.—The canes in North Bihar are the thin indigenous ones common in North India, although there are some indications that selected thick canes may be grown with advantage. Bihar is, in fact, to some extent a transitional region between the great sugar-cane tract in North India and the more tropical area of Bengal and Assam. There are a number of sugar-cane factories working, and these I believe are, in the main, successful. I am led to think that this success is largely due to the fact that the country is one in which the European planter has worked for many years. He has capital, a crop is needed to replace indigo, the people

have long been accustomed to work with him and grow the crops for his factories; he has a certain amount of control over the crops grown and not infrequently a certain amount of land is attached to the factory to form a basis for cultivation. The price of *gur* although rather high at present is, I believe, as low as anywhere in India, so that from the contiguous part of the United Provinces, it is sent as far as the Central Provinces and the Punjab. The pressing need in Bihar is, to my mind, the suitable location of a first class sugar station where varietal and other experiments can be instituted with a suitable staff for combined work with the planters. I am told that the local agriculture leaves much to be desired and the canes certainly need replacing by better varieties.

United Provinces and Punjab.—The special conditions in Bihar and Assam are absent further north-west, and the prospects become increasingly less satisfactory. The canes grown are excessively thin and fibrous, the yield per acre is small and the percentage of sucrose in the juice is often low. This would, furthermore, greatly increase the area required for an up-to-date factory with an increase in the cost of cartage. The fields are small and scattered and the cultivators are unaccustomed to sell their crops to a central factory. I do not think that there is much prospect of instituting sugar factories in this region, under present conditions.

WORK IN PROGRESS.

A great deal of work is being carried out on this crop by different Agricultural Departments, but this is scattered and deals with purely local problems. Two experts have been entertained by the Government of India, both of whom are located in Provinces and under the local authorities. A Sugar Engineer is engaged in the United Provinces and a Sugar-cane Expert in Madras. With the work of the former I am not acquainted, and I propose here only to deal with the latter, in that I consider that the fundamental problem before India is the

improvement of the class of canes grown. This is the problem for the solution of which the Cane-breeding Station has been started at Coimbatore. The main line of work is to replace the local North Indian canes by seedling canes, and this, unfortunately, cannot be done in North India because the sugar-cane does not flower there. Attempts are being made to obtain new varieties by crossing thin indigenous canes with thick tropical ones, thus combining useful characters of the two classes. Hardy, moderately thin, rich canes are aimed at, which will grow in North India to maturity and be able to withstand the local indifferent treatment at the hands of the ryot. That such an ideal is not unattainable is shown in the first place, in that crosses have been obtained, although not at present in sufficient quantity or sufficiently studied for distribution, and secondly, because a trial of such a cross has been rendered possible by work in Java. A seedling cane raised there under the No. Java 36 was obtained in Madras and forwarded for trial by the Sugar-cane Expert to Shahjahanpur. It was obtained in Java by crossing the local *Chunnee* of Shahjahanpur with the rich Cheribon of Java. It has been tested now for some years at the Shahjahanpur Farm, by Mr. Clarke, and the latest accounts have been very favourable, in that last year all the available setts (some nine lakhs in number) were eagerly taken up by the cultivators. Another variety was introduced by the advice of the Sugar-cane Expert into the Partabgarh Farm, and it has rapidly extended until, in the present year, some hundred acres are under it near that place. These two cases are given as a sample of the work which it is intended to carry out when the new varieties being evolved at Coimbatore are ready for distribution. Altogether some 130,000 cane seedlings have been raised at the Cane-breeding Station, and it is confidently anticipated that, from among these and those still being obtained, it will be possible to allocate

suitable seedlings for every part of India. It has been estimated that the results of the introduction of new and better canes into Madras some years ago by the Samalkota Sugar Station have culminated in a gain of Rs. 25 per acre, totalling 25 lakhs a year. If the improvement in North India reaches the modest sum of Rs. 5 per acre, it will mean ten crores a year in the ryots' pockets.

It is perhaps needless to point out that if such an improvement can be brought about the question of sugar-making in India will enter on an entirely new phase. The price of *gur* would be regulated all over the country and probably considerably reduced by the greater yields obtainable and there would be a surplus available with more suitable cane varieties for the flotation of sugar-making concerns. But the whole question has its complications, and I do not think that useful results can be obtained with certainty, unless a large view is maintained and the work is properly organized.

FOUNDING OF A SUGAR DEPARTMENT FOR INDIA.

For this purpose I would suggest the formation of a small Sugar Department for India, to be placed directly under the Agricultural Adviser to the Government of India. I would indicate some of its objects in the following manner, but it is inevitable that the relative importance of the different lines of work would only be clearly understood as progress could be reported.

(1) The collection into one office of the scattered information recorded regarding the character of the sugar-cane tracts in India, the varieties grown, the methods of cultivation and of making the finished product.

(2) The collection of similar information regarding all previous attempts at founding sugar factories, with the reasons for their discontinuation.

Much of this information (under 1 and 2) is now to be found in the files of various Secretariat and other offices in the Provinces,

but it is not available and it is desirable to get it together, collate it, and, doubtless in some cases, to publish it in book form or otherwise to serve as a basis for future work.

(3) A continuation of the work on improving the class of canes growing in different parts of the country.

(4) An organized investigation into the local practices of *gur*-making throughout the country with the object of introducing improvements according to the local conditions.

(5) A special study of the possibility of starting a sugar-making industry in the various tracts where sugar-cane is grown.

For such a Department to be effective I would suggest the attachment of the following experts:—

(1) A factory expert. He should be thoroughly acquainted with the conditions in India as regards factory work, labour difficulties, general cultivation and the use of by-products. It would be an advantage if he had a working knowledge of the factories and plantations in Java, where the conditions are somewhat similar to those in India.

(2) An engineer, for the study of existing installations and the preparation of new models and combinations of *gur* and sugar-making.

(3) A chemist for the study of the cane juice and fibre, to conduct ripening tests and manurial experiments, and to assist in the factory work.

(4) An agriculturist, whose main duty would be to study the local conditions of soil and climate as effecting the need of irrigation and drainage, the proper times for planting and reaping and the relative period of growth in different tracts.

(5) A botanist, for the study of the numerous varieties existing, the transference of varieties from place to place and the raising of new seedling canes for each tract.

Such a Department would, at the outset, be largely engaged in collecting material already existing in the country, so as to gain

experience as to the proper lines for work. It should therefore be in close touch, consultatively, with the Provincial Departments of Agriculture interested in the crop, and should be prepared to assist and further any work now being carried on by advice or in any other way. Where local effort is considered insufficient it should inaugurate plantations or experiments on its own initiative, but I would specially desire that efforts should be encouraged, because the officers on the spot will of necessity have the most reliable first-hand information as to the conditions and possibilities of their tract. The work at present being conducted on sugar and the sugar-cane is scattered and, for the best results to be obtained, I feel sure that it needs to be organized under one hand.

BURMA AS A SUGAR-CANE TRACT.

This province has been visited by the Sugar-cane Expert for the first time since the above report was written. I find that there are large areas in Upper, Middle and Lower Burma where thick canes can be quite easily grown. I have only met with one indigenous Indian cane and consider it an introduction from its botanical character, either from Natal or Bihar. There is any amount of uncultivated land available for the growth of sugar-cane, so much so that there is no part of India which can for a moment compare with Burma as a possible place for installation of sugar-making factories. Communications are over large areas quite good, much better in fact, than I had been led to expect. The population is, however, extremely sparse and labour will have to be introduced. The canes grown, although thick, are generally inferior and I am at once sending over half-a-dozen good varieties for their replacement. The local Agricultural Department is wholly insufficient as to numbers and fully employed on useful work and any steps taken will have to be supported by the Government of India. I would suggest the starting of a small sugar-cane station in each of the five tracts which I have studied for the acclimatization of better kinds and a study of the best methods of growing the canes. Everything connected with the sugar-cane in Burma is on an extremely primitive plane, but in almost every place I visited its cultivation is being extended.

SUGAR INDUSTRY.

BY N. LAKSHMINARASIMAIYA, B.A., B.E.

THE popular term *Sugar* means almost all sweet substances found in fruits, nuts, vegetables, saps of trees, etc., but in its restricted sense the word means only ordinary white sugar obtained from sugar-cane and sugar beet. Chemically, sugar is the most important of the three members (sugar, starch, and cellulose,) of the family of carbohydrates. It is not my intention, not to speak of my incompetency, to place before you to-day any scientific account of the growth of world's sugar industry or the perfection it has reached in some of the petty States of the world, or to trace the vicissitudes it has undergone owing to international trade relationship. I propose to confine my remarks to the state of affairs with regard to sugar-cane industry in India and Mysore in particular and to the methods and devices adopted with a determination to develop the industry.

Etymologically, sugar seems to be of Indian origin, the earliest forms of the word being "Sarkara" in Sanskrit and "Sakkara" in Prakrit. The cultivation of genuine sugar-cane appears to have been quite common in India in very remote days and tradition traces its creation to Viswamitra who amongst other things intended this to serve as heavenly food to Thrisanku in the temporary paradise organized for him. The first kind of sugar mentioned is only what is now known as "Gur" (Guda in Sanskrit) and to-day the state of the industry has not advanced a step further. It is, on the other hand, no consolation to know that sugar-cane spread itself in various countries and high class refined sugar is being dumped into the mother country.

After the conquest of Alexander the Great, Arabs and Egyptians soon learnt the process of purifying raw sugar. China improved on

this and made light coloured sugar. Between the eighth and the fourteenth centuries, sugar-cane cultivation was known to Spain, Philippines, Formosa, Japan, Egypt and South of France. Later on, in consequence of the colonization of Brazil, Guiana, West Indies, and South America, the production of sugar apart from similar growth of beet sugar increased so rapidly that sugar which up to that time had been considered as a costly article, became in a marvellously short time an article of common consumption. The introduction of tea and coffee created also a general demand. The annual production in several countries increased enormously.

Until quite recently, India remained the greatest sugar producing country in the world. Its present importance is insignificant inasmuch as its exports have fallen off. The following figures give a rough idea of how the decay has been gradual.

Year.	(average)		Exports. Tons.	These Figures are abnormal.
1882-1892	„	...	59,000	
1892-1902	„	...	36,600	
1904	„	...	8,640	
1910	„	...	6,170	
1914-1915	„	...	40,334	
1915-1916	„	...	10,803	
1916-1917	„	...	23,613	

On the other hand, India has become a good field for foreign manufacturers as regards the importation of sugar. The following figures give an idea of the volume of business:—

(average)			Tons.
1884-1889	„	...	86,100
1890-1891	„	...	89,100
1895-1896	„	...	99,000
1900-1901	„	...	128,700
1905-1906	„	...	226,218
1909-1910	„	...	586,169
1914-1915	„	...	550,120
1915-1916	„	...	642,774
1916-1917	„	...	542,218

Whereas the exports and imports were almost equal thirty years ago, the exports have dwindled away to nothing and the

imports have risen by 700 per cent. This, in money value would mean an increase from Rs. 18,880,000 to Rs. 154,500,000.

Then again, the acreage under cultivation was

1890-1891	...	...	2,758,450
1895-1896	...	...	2,930,583
1900-1901	...	...	2,522,442
1905-1906	...	...	2,241,750
1911-1912	...	...	2,370,000

showing that within twenty years there has been a fall of 15 per cent in the extent of cultivation. There is no doubt that perceptible reduction in imports cannot be attained if merely all the area originally under cultivation is brought into operation. Mr. Noel Paton, Director-General of Commercial Intelligence, states (1909-10) that while the imports of sugar have increased by 3,97,009 tons in ten years, the quantity of potential sugar has decreased by 4,08,792 tons. By potential is meant not the quantity really made from cane crop crushed but the total available or potential sugar that could be obtained. It has often been stated that the cultivation of cane has been neglected due to high prices in food grains, cotton, etc. But sugar is a food crop and there must therefore be some depressing influence peculiar to itself with the result that the Indian cultivation of cane and the production of jaggery are steadily declining.

Theorists have said that if the cultivation and the manufacturing methods are only improved and modernized slightly, India could not only supply its own wants, but would also rank among the sugar exporting countries. I believe, this has been said fairly often and yet the planted area and production is less to-day than what it was fifteen years back. Others say that the Indian ryot is conservative and poor and the lands are divided into several bits and there is lack of co-operation. All these may be true but should we watch with folded hands the slow death of one of our largest industries?

Before coming to the sugar-cane

cultivation and manufacture in Mysore, I lay before you to facilitate purposes of comparison short accounts of the sugar industry in Formosa and Java.

Formosa is a small island in the China sea with an entire area of 13,504 Sq. Miles, and a population of 3,039,000. The south-west portion is an extensive plain where sugar-cane is cultivated. The climate is tropical and the rainfall is very considerable. There is a net work of railways and besides there are light railways amounting to 220 miles on the plantations for transportation of cane and sugar.

In 1895, Formosa became a part of the Japanese Empire and at that time there were 1,000 small factories all worked by buffaloes and they prepared brown sugar. With these crude methods, and bad cane about 45 per cent of juice was obtained while the renderment of moist sugar was 6 per cent. In 1900, Japanese Government awoke and seriously considered the question of development of sugar industry. The first work done was to send out young Japanese students to countries where sugar industry was at a high degree of development, especially Germany, Java, and Hawaii.

At Home, various kinds of cane were experimented upon, sugar factories which were founded, obtained during the first five years a Government subsidiary of 6 per cent on the paid up capital. Promoters, in other cases, borrowed machinery from Government for five years which meant that Government paid for the machinery and claimed the money from the hirers only after five years had elapsed. The cane planters could also get lands on very moderate terms and manure was gratuitously provided by the Government. But the Chinese farmer refused to sell cane to the manufacturers and chose to grind it in his own primitive way, so that the Government plans to turn Formosa to another Java fell through. The natives refused to plant new kinds of cane although subsidized by Government. When

all persuasive methods failed, Government took stronger measures (1905) and issued ordinances compelling the planter to sell the cane to the factory in the District and prohibiting him from either exporting it or crushing in his buffalo mill. This brought on the desired wholesome influence and there are at present thirty-eight factories with a capacity of 15,000 tons of cane per day, and a capital of Rs. 32,500,000, manufacturing sugar and the number of buffalo mills fell to two in 1908. There is a preferential treatment given to this sugar by Japanese Government. Sugar from Formosa sent straight to Japan for consumption was exempted from import duty. Besides, the Government have always an eye in the interest of the farmer. The manufacturers are expected to pay a fairly high price on cane for the planter and advance money to help them through the bad times. The planters too have their rights and if the price offered is too low they can grow other crops than cane.

Java:—Java is a small island in the Indian Ocean. Its total area is 48,688 Sq. Miles. Average rainfall is fourteen inches and temperature is 200°C. The population is 28,600,000. The whole island is intersected by a net work of well developed tramways which are connected by a main railway running through the island. The island has some remarkable physical and economic advantages so far as sugar industry is concerned. Cane cultivation is carried on land which is not the planter's property, but is rented by him. The sugar factories plant all cane round their factories under their own management. The manufacture and agriculture are thus under common control. There is abundant supply of labour at five annas per day and the land is taken on rent of about 30 to 40 Rs. per acre. The farmer is glad to rent out on a high rental and the sugar-cane companies consider the rent to be light. The sugar companies actually enjoy a practical security of tenure. With these advantages their

methods of sugar production are extremely efficient and well carried out. They spend money freely on research work. The result is that Java sugar dominates in eastern market, particularly in India, and not only does the trade dispense with any protection subsidy or assistance from Government, but it successfully gives its way through hostile tariffs and pays enormous dividends on invested capital. Mr. Keatinge, Director of Agriculture of Bombay, in his note states that the cost of cane production is Rs. 117.61 per ton. The selling price being about Rs. 169, a net profit of Rs. 51 per ton is realised.

The production of sugar was

47,000 tons in 1840
136,000 tons in 1860
216,000 tons in 1880
744,000 tons in 1900
1,466,600 tons in 1910 (300 per cent increase)

and the average yield of sugar per acre was 4.3 tons in 1910.

Coming homewards, Mysore has an area of 29,461 Sq. Miles and has a population of 5,705,359 and irrigation is very largely by tanks, but there are several wells used for the purpose, and channels to a length of about 1,200 miles. The actual land under cultivation is 7.735 million acres out of which 32,287 (0.4 per cent) acres are used for sugar-cane cultivation. The statistics show, however, a steady increase in the extent.

	Acres.		
1881	...	...	26,000
1891	...	...	32,000
1901	...	...	47,430
1911	...	...	44,400

Whereas the season and crop report for 1915-1916 shows that it has decreased to 32,287 acres in that year.

One of the main points for consideration is that sugar-cane cultivation is scattered all over the State. There are nineteen taluks where extent is less than a hundred acres and twenty-seven taluks having less than 500 acres of sugar-cane cultivation. In seven taluks only does the cultivation exceed

1,000 acres. As in all other places in India, it is cultivated in patches, the planter being in most cases the ryot. In some other cases the landlord and ryot enter into equal shares with each other. The water for irrigation is mostly obtained from tanks, but in some cases water is lifted from wells. Recently, after the establishment of this Department, about seventy pumping installations have been installed. A survey of their present financial condition shows that some of the owners have taken full benefit of the plants and others either due to want of enterprise or land or capital have been using them spasmodically. It is easy to show how the cost of irrigating an area of land with these pumping plants falls within Rs. 30 to 40, but it must be remembered that such cheap results can be obtained only when full work is taken out of the plant. I will explain my argument by a single instance.

One pumping plant is installed on a well in the Chittaldurg District. The plant consists of a 7 H. P. engine and 3" pump. At present it is being used to irrigate half an acre of sugar-cane land and half an acre of betle leaves garden. The cost of running the plant for irrigating this one acre comes to about Rs. 100 a year. Whereas, a similar plant installed five miles from the above place is irrigating about eight acres of sugar-cane and the cost of working is reported to come to Rs. 35 per acre. It is stated that in the territory of Hawaii the cost of irrigating one acre of cane comes to Rs. 217.79 and yet a profit of Rs. 60 per ton of sugar is made. The fault, therefore, is not in cost of irrigation but somewhere else. It is well known that rich manuring is required for a good crop of sugar-cane. But the manure used by our ryot is the village refuse and night soil only in very meagre quantities. In Java, with the use of 400 lbs. of ammonia sulphate costing Rs. 42, they are able to produce four tons of sugar per

acre whereas we with meagre manuring and bad methods of milling and boiling are able to get about one ton of jaggery per acre. The Department of Agriculture is demonstrating the advantages of oil cakes as manure, and it is hoped that with greater number of oil mills started in the State and increased facilities of getting cake and manufacture of superphosphates the agricultural side of the question will improve.

Let us now turn to the process of manufacture of jaggery. When the crop is getting ready, one or two ryots in the village join, level up a bit of ground in the fields, put up a temporary shed, erect a small sugar-cane mill, either taken on hire or their own, and start milling the cane. The mills are driven by bullocks, at least two pairs are required for each day's operation. The juice extracted is collected in pots and is put into open circular pans taken on heavy rental. Crude ovens are built and the juice is boiled, the fuel used being bagasse and thin light wood. The slow process is repeated day after day and it is estimated that one acre of cane takes twenty days to be crushed, milled, and converted into jaggery. By the time half the cane is cut and converted, the season for planting fast approaches, the ryot leaves the old cane to take care of itself, sometimes goes to the extent of burning it, and devotes all attention to fresh planting. The waste that is going on every day in the sugar field appears enormous, even to a casual observer; but the ryot takes it coolly and thinks that waste is inevitable. Besides, he pays very heavily by way of rent for mill, pans and bullocks. All this is no consideration for him. When converted into money value it appears as though he is spending about half the cost of jaggery in the process of manufacture.

The following figures give a rough idea of the situation :—

One acre of cane :—

	Rs.	a.	p.
1. 40 Coolies at 3 annas per day for cutting cane	7	8	0
2. Hire on one iron mill at 8 annas per day	10	0	0
3. Hire of bullocks 2 pairs at Rs. 1-8-0 each pair per day	60	0	0
4. Hire of boiling pans at 2 annas per day	2	8	0
5. Wages of men	2	0	0
6. Oil, etc.	6	0	0
7. Present of jaggery for boiler	5	0	0
8. Stray fuel in addition to bagasse	2	0	0
Total Rs.	95	0	0

During all this period, men and cattle are allowed to chew as much cane as they can and I have not taken into consideration the waste due to juice left in the partly crushed cane. The mills in themselves are inefficient and the owner of the bullocks is in no way anxious to weary his bullocks more than absolutely essential. If we convert these items to money value, we can, without hesitation and fear of contradiction say, that one acre of cane costs Rs. 120, for crushing and conversion into jaggery. Compare with this the actual cost of manufacture of one ton of sugar, including production in Java, Rs. 117'6.

All these circumstances were carefully studied by Mr. Chatterton when he was Director of Industries and Commerce in Mysore and he proposed to Government that demonstration sugar factories with power driven mills and improved furnaces should be established. The proposal was sanctioned by Government in their order dated 24-10-1912, and due partly to prejudices and partly to false rumours spread regarding cost of manufacture in these mills, considerable difficulty was experienced even in the selection of sites. Finally, three sites were selected, one at Chicksagare under Mavatur Tank, one under Kunigal Tank, and the third at Haravu under the Cauvery channels.

1912—1913.

	Capital Expenditure.	Receipts. 1912-13.	Expenditure
	Rs.	Rs.	Rs.
Chicksagar	7,273 7 0	1,593 4 6	1,646 9 2
Kunigal	8,200 0 0	743 8 11	1,060 11 9
Haravu	8,321 4 10	364 3 6	1,031 9 9
		2,701 0 11	3,738 14 10

1913—1914.

Capital expenditure up to end of June.

12,235 4 7	1,898 7 7	2,883 7 1
10,287 3 8	2,200 0 8	804 1 8
10,467 7 8	2,133 2 4	5,334 5 11
	6,231 10 7	7,021 14 8

1914—1915.

	Receipts.	Expenditure.
Chicksagare ...	2,630 11 0	95 14 0
Kunigal ...	...	2,607 5 0
Haravu ...	448 12 5	245 0 0
Shikaripur ...	875 5 2	817 14 10
	3,953 12 7	3,766 1 10

1915—1916.

	Expenditure.	Receipts.
Chicksagare ...	786 5 7	492 2 10
Kunigal ...	1,408 9 9	1,540 6 9
Haravu ...	450 1 0	159 13 3
Shikaripur ...	1,486 12 5	1,405 8 7
	4,131 12 9	3,534 15 5

1916—1917.

Chicksagare	1,776 15 7	1,285 5 4
Kunigal	...	...
Haravu	...	...
Shikaripur	...	...
	1,776 15 7	1,285 5 4

Maunds.

1st. year	...	9,604
2nd. year	...	8,913
3rd. year	...	13,645
4th. year	...	12,654
5th. year	...	9,228

The erection of the plant was completed late in April. During the first year, cane supply was very good at Chicksagare, but at Kunigal and Haravu there was great difficulty owing to the fact that the ryot brought to the mill over ripe, diseased and inferior cane and the jaggery was completely spoiled.

It was found that the total expenditure incurred on fuel was Rs. 3,227 and experiments were commenced with special bagasse burning furnaces with the evaporating pans arranged in series. But the season was bad, there was a prolonged draught and the sugar-cane crop was bad. At the end of the second season, it was claimed that these mills were capable of producing 3,000 maunds of jaggery per month at two annas a maund. The ryots were found to be generally willing to cart the cane to the mills and pay four-and-half annas a maund of jaggery and Mr. Chatterton stated that he has solved the most serious of the difficulties encountered by the ryot, *viz.*, the provision of adequate means of crushing his cane crop.

During the year 1914-15, two new plants were installed, one at Shikaripur by Government and another at Harihar by a private individual. Of the three plants in existence, only Kunigal Mill did some work, as the unfavourable character of the rainfall had militated against development of improved methods.

In the year 1915-1916, two more plants were installed, one at Bannur and other at Sabbenhalli for co-operative credit societies. The second one started work well.

During the year 1916-17, the plants were worked again in Chicksagare, Shikaripur, Sabbenhalli and Sakkarepatna under Departmental control with the same results. The mills in no station have worked to their full capacity and the results so far achieved only go to show beyond doubt that good jaggery could be made in them much more rapidly and with less labour. But they have neither worked profitably nor have produced good jaggery always. The unsatisfactory state

of affairs is due mainly to irregular supply and at times the cane supplied was inferior. The irregular supply interfered with continuous work and the inferior cane that was accepted in our anxiety to keep the mill going produced inferior jaggery.

Below is given the actual cost of crushing one acre of cane in the power driven plants and converting same into jaggery:—

	Rs.	a.	p.
1. Cost of crude oil, lubricant, etc., for 2 days.	20	0	0
2. Cost of labour 60 coolies (male and female) at average 4 annas ...	15	0	0
3. Fuel, kerosine and other contingencies	5	0	0
4. Depreciation on plant at 10 per cent working 100 days in the year and crushing 50 acres.	24	0	0
	an acre.		
Total Rs. ...	64	0	0

The percentage of juice extracted in these mills is about 10 to 15 per cent more in quantity than in a bullock driven mill. It is also established that no extra fuel is required in the megass burning furnaces and that the megass and cane trash are found sufficient when worked continuously. As stated already, better organization and perseverance are necessary.

The plants were in existence for five years and it was high time to think of some improvements to work them to their full capacity. The Director of Industries proposed as an experimental measure to purchase cane fields before the milling season commences to ensure a good and regular supply and arrange to cut and cart cane to the mill. Passing, I may here draw the attention to the state of affairs that once existed in Formosa when the local farmers refused to sell cane to the factories and how the Government had to issue ordinances in the matter and how, with that piece of legislation, the state of affairs was transformed in a couple of years, and

to-day there are no buffalo driven mills in the State.

In a recently erected experimental furnace at Hudi, about ten miles from Bangalore, the difficulties referred to above are overcome. Arrangements are made for a regular supply of cane. No cane is allowed to stand after cut for more than twenty-four hours. The quality of cane obtained is uniform. The person for whom the furnace is erected takes as much interest as the Department. Steps have been taken to ensure a regular supply for a period of two months. We are on an average making seventy maunds a day and the quality is very good. This installation has proved beyond dispute that organization and co-operation between all interested parties are two essential factors in the success.

Our achievements, though good in themselves, are not very grand. In my humble opinion only a beginning has been made and more attention has to be bestowed on it. The reports show that in most of the sugar-cane growing areas, such as Chickballapur, Chennapatna, Seringapatam, and Shikaripur, the cultivation is actually going down. The reason is not far to see. There were several small workshops started in these places to manufacture bullock driven power mills, to repair and re-groove the rollers, and whenever necessary to supply pans on hire. There were itinerant parties who undertook the crushing of cane and boiling juice. With the war, these workshops found it difficult to get supplies of cast iron, coke, etc., and they are shutting down. The ryot, therefore, who was entirely dependent upon the supply of mills from their workshops having no other resource to fall back upon, hesitates to take to sugar-cane cultivation. With the present extent of cultivation itself, it is possible to introduce at least a hundred of the power driven plants but no progress can be achieved until normal conditions are restored or are we in a position to manufacture engines locally.

To develop the industry immediately, a

dozen plants should be installed in large sugar-cane areas and they should be worked on highly organized lines. Special arrangements must be made for either purchase of cane or good supply otherwise. Responsible officers should be posted to conduct the operation and minimise working expenses and maintain correct records. At the end of two or three seasons the very persons who had established workshops for manufacture of bullock mills will come forward and take up the concern and work it on factory lines. The manufacture of jaggery itself is a business proposition, and it requires a different agency to handle. Our ryot must be relieved of the anxiety to mill his cane. He must be left to attend to producing good cane. The manufacturer of sugar appreciates good cane and pays well for the same. These demonstration factories established by Government may even prove that they may be run on commercial lines but our business men are shy and unless confidence in the mind of the planter is created, no good result can come out. It may be necessary for Government to subsidise these mills for popularising them. In other cases where a person or a body undertakes to establish the mill and planting large extent of cane, other facilities should be created—such as grant of land at concession rates, supply of oil cakes and machinery at some concession.

I have so far only considered the question of improved method of manufacture of jaggery and I have not dealt with the manufacture of sugar. Authorities on the subject say that no where in Mysore can a sugar factory be established as the cane cultivation is not very extensive in any one place. But a small sugar plant to deal with 3,600 tons of cane in a season of one-hundred days could be obtained and worked on commercial lines. It is possible to select a place where this quantity can be obtained. The extent of cultivation required at fifteen tons per acre on an average would be about 240

acres. A small sugar factory alive to its interest and the interests of planters will considerably influence the sugar industry of the State.

Such a factory requires a capital of about one lakh of rupees for machinery and buildings and another 50,000 Rs. for working expenses and to pay advances for cane, etc. Assuming that the plant is kept steadily working for one-hundred days and deals with 3,600 tons of cane, the financial position of the factory may be roughly stated to be as follows:—

	Rs.
3,600 tons of sugar at Rs. 320/- a ton ...	115,200
Molasses 60 tons at Rs. 50/- a ton ...	3,000
(assuming that the plant for utilization of molasses into manufacture of rum and alcohol is not installed)	118,200

On the debit side:—

We have 3,600 tons of cane at Rs. 20/- a ton ...	7,200
Cost of manufacture at Rs. 30/- a ton ...	10,800
Interest on capital of 1½ lakhs at 6 per cent ...	9,000
Buildings (25,000) at 4 per cent ...	1,000
Depreciation of plant (75,000) at 10 per cent ...	7,500
Profit L. S. 15,000 representing 10 per cent on capital. ...	100,300

I may here mention that a Sugar Refinery was established at Goribidanur by South Indian Industrials some years back and it has recently been shut down. It will be an interesting work to the Department of Industries to work it on commercial lines provided that by Government legislation the ryots are made to deliver all the cane grown in and outside Goribidanur at the Factory.

THE INDIAN JUTE INDUSTRY.

By R. W. BROCK.,

Assistant Editor of "Capital."

IT is not perhaps easy or possible to say anything new concerning jute manufacture. An industry that exerts so great an influence on the fortunes of an important section of India's agricultural population; that gives employment to so many factory workers; that utilises such large amounts of capital; and that holds in its hand the industrial status and future of so important a city as Calcutta, has necessarily been much written upon. It has been again and again insisted that no country in the world is so favourably situated for manufacture of all forms of jute goods as Bengal, and no city so favourably situated as Calcutta. The fluctuations in the prosperity of the mills, the varying price but enormous aggregate value of the jute crop, the great profits and abnormal dividends jute mills have earned, are known to every business man and investor in the country.

An equally familiar theme is the enormous quantity and highly valuable nature of the war materials jute mills have recently supplied, chiefly in the form of sand-bags, etc., the indirect commercial effect of the huge Government orders for such material constituting, indeed, the dominant factor in contributing to the mills' abnormal prosperity. The course of the jute share market is watched with varying hope and anxiety alike by investors and speculators, and the Calcutta Stock Exchange has been the scene and centre of more jute share transactions since 1915 than possibly in any corresponding period in its history. Share transactions and fluctuations, however, are of temporary importance. The main issues lie in other directions and concern chiefly such questions as supply of raw material, increase in manufacturing power, competitive position of

foreign mills, and last, not least, the great question of tariffs. It can be taken as understood that, in the right quarters, such problems are receiving the most anxious consideration. Meanwhile, before indicating, briefly, how these vital matters stand, it may be worth while emphasising that jute manufacture came into existence with little aid from Government, and that taking jute as an example of spontaneous industrial development, what has been done before can, it may fairly be urged, be done again. In other words, when would-be industrialists cry out for Government aid, and assert that no industry can attain success without such aid, there is an obvious retort. It should suffice to point to jute. One feature about jute is unique. It grows successfully in no other country. But despite this fact, the establishment, finance, and control is, and always has been, wholly "foreign." That, I venture to think, is a very significant fact. The Bengalis are not merely not financing jute mills, and retaining their profits. They are even being pushed out as employees, *viz.*, by labourers from other provinces. Of what possible use, it may reasonably be asked, is it for Bengalis to invite official aid in establishing new industries when their capitalists and labourers are not even ready to take their fair share in financing and working industries actually in existence? What indeed, could be more utterly inconsistent?

So far as the Bengalis are concerned, they have, it has to be said, never got beyond the old hand-loom stage of manufacture. The process of weaving gunnies for bags and other coarse articles by hand-loom weavers has been described as follows:—

"Seven sticks or chattee weaving-posts, called *tana para* or warp, are fixed upon the ground, occupying the length equal to the measure of the piece to be woven, and a sufficient number of twine or thread is wound on them as warp called *tana*. The warp is taken up and removed to the weaving machine. Two pieces of wood are placed at two ends, which are tied to the *ohari* and *okher* or roller; they are made fast to the *khoti*. The belut

or treadle is put into the warp; next to that is the *sarsul*: a thin piece of wood is laid upon the warp, called *chupari* or regulator. There is no sley used in this, nor is a shuttle necessary; in the room of the latter a stick covered with thread called *singa* is thrown into the warp as woof which is beaten in by a piece of plank called *beyno*, and as the cloth is woven it is wound up to the roller. Next to this is a piece of wood called *khetone*, which is used for smoothing and regulating the woof; a stick is fastened to the warp to keep the woof straight.

To indicate the variety of uses to which jute is applied, the following quotation may be cited from the official report of Hem Chunder Kerr as applying to Midnapur:—

"The article manufactured from jute are principally (1) gunny bags; (2) string, rope and cord; (3) *kampa*, a net-like bag for carrying wood or hay on bullocks; (4) *chat*, a strip of stuff for tying bales of cotton or cloth; (5) *dola*, a swing on which infants are rocked to sleep; (6) *shika*, a kind of hanging shelf for little earthen pots, etc.; (7) *dulina*, a floor-cloth; (8) *beera*, a small circular stand for wooden plates, used particularly in poojahs; (9) painter's brush, and brush for white washing; (10) *ghunsi*, a waist-band worn next to the skin; (11) *gochdari*, a hair-band worn by women; (12) *mukbar*, a net bag used as muzzle for cattle; (13) *parchula*, false hair worn by players; (14) *rakhi-bandhan*, a slender arm-band worn at the Rakhi-poornima festival; and (15) *dhup*, small incense sticks burned at poojahs."

It may possibly be suggested that in view of the enormous expansion in the use of textile machinery that had occurred in the United Kingdom, the procurement of machinery to manipulate jute fibre involved no special difficulties; but the actual sequence of events does not fit that theory. Jute at first was unpopular. Warden, in his *Linen Trade*, says:—"For years after its introduction the principal spinners refused to have anything to do with jute, and cloth made of it long retained a tainted reputation. Indeed it was not until Mr. Rowan got the Dutch Government, about 1838, to substitute jute yarns for those made from flax in the manufacture of the coffee bagging for their East Indian possessions, that the jute industry in Dundee got a proper start. That fortunate circumstance gave an impulse to the spinning of the fibre which it never lost and

since that period its progress has been truly astonishing."

COMPETITION WITH DUNDEE.

The foregoing paragraph mentions Dundee which stands out as the pioneer centre of jute manufacture in the United Kingdom and retains the same monopolistic hold upon the industry in that country that Calcutta exerts in this. The competition of Calcutta and Dundee mills for foreign markets is keen and of long-standing and tends,—on account of various advantages—to work in the long run, in favour of Calcutta. This competition showed itself early. In 1896 Sir John Leng, M. P., representing Dundee interests, complained that "Calcutta has not only taken the whole of the Indian, Burmese, the Straits and Chinese, the Californian and Australian trade in gunnies, but is making large inroads in North and South America, the Cape, Mauritius, Egypt, the Levant, and the Continent. Not only so, but large shipments are coming to this country (United Kingdom). In the same way during the last four years the hessians exported from Calcutta to America have nearly trebled, as have those to the United Kingdom; while to the continent they are tenfold what they were in 1892. In the modern phrase, Calcutta jute manufactures have been on the 'boom' for several years. The manufacturers have made large profits, with the inevitable result that large extensions of machinery and the building of new mills are now in progress." (This was twenty-two years ago, and the industry is now going through exactly the same process again, new mills being founded and old mills acquiring new looms, etc.)

And what Sir John Leng had to say concerning the relative positions of Calcutta and Dundee is applicable to-day:—He was impressed, he said, "with the great advantages the Calcutta mills possess. (1) In their locality in and near the jute growing districts, with direct railway and river communication, bringing the raw material and coals direct to the works, and facilitating the

direct shipment of goods to all parts of the world. (2) The proximity of Calcutta to all the Eastern and Pacific markets; the numerous opportunities for exportation by the many regular lines of steamers and the ubiquitous 'tramp'; and the extraordinary lowness of freight, making thousands of miles less considerable than ten's or hundred's formerly were. (3) The astonishing cheapness of native labour, wages being on the average less than one-fourth what they are here, and although one-third more hands are required, and the cost of European Superintendence is heavy, the low wages bill on the aggregate tells immensely in favour of the Indian mills. This appears the most important permanent factor in the entire calculation. (4) The longer hours the machinery is run enables the manufacturers to obtain a much larger production from a given amount of plant than in this country. The geographical protection which Calcutta enjoys whenever there is a glut in the market in India enables it to dispose of its surplus abroad at a lower price, and so forces Dundee to take that price for all Dundee produces, while Calcutta has the benefit of the higher price in India maintained by the export of the surplus."

We may also perhaps endorse another observation offered by Sir John Leng, *viz.*, "Calcutta is the child of Dundee. A large majority of the mill managers, foremen, and assistants are Dundee men. They were born and bred in Dundee or the district. Here they learned all they know of the business. From Dundee most of the mill plant is being obtained. Dundee is the outfitting establishment to which Calcutta must mainly look both for the men who are to guide, and the machinery which is to produce, its manufactures. It would not benefit Calcutta, as the phrase is, to wipe out Dundee, from which its own vitality has been and is being largely drawn."

It cannot be said that these sage observations have lost any part of their

original force. The roots of the Indian jute industry are still abroad and there is certainly no section of the Indian population equipping itself to take over jute as the Parsis at Bombay have taken over cotton manufacture. The jute industry, on its industrial side, therefore promises, at all events for many years, to remain wholly British.

VIEWS OF THE TARIFF COMMISSION.

The above quotations indicate the stage of development reached in 1896. Ten years later the Tariff Commission, after considering the position of Dundee mills, summarised its view of the position, and especially of the competition of the Indian jute industry, thus:—

There is much evidence in regard to the rapid development of the jute industry in India, and its serious competition with the Scottish industry in British and foreign markets.

The special advantages of the Calcutta industry are summarised thus:—

- (1) Cheapness of labour estimated at one-third cheaper than British labour.
- (2) Proximity to the jute growing Districts.
- (3) Proximity to the great Eastern markets.
- (4) Long working hours. (Calcutta mills are said to work for 15-16 hours daily and, in some cases, for 22-24 hours daily on the two and three-shift system respectively.)
- (5) Lax sanitary and factory conditions as compared with Great Britain.

The 'clear advantage' to Calcutta manufacturers is thus stated by one firm as at least £ 3 per ton, 'and they can afford to use a finer quality of jute.' The result is that Calcutta is spoken of as being now by far the largest manufacturing place in the world for jute goods—its consumption of raw jute is stated to be over 3,000,000 bales and it largely supplies the United States, Australasia, the Argentine and Eastern markets,

generally with jute cloth. There is probably, witnesses say, no textile trade in the world so profitable as the jute trade in Calcutta, and 'if the working time be shortened, still greater extensions will result.' To the rise of the Calcutta jute industry is mainly attributed the stagnation of that industry in Dundee. When the Calcutta supply fails, or Argentina requires jute goods delivered in a hurry, finding suddenly they have a very great harvest, then occasional trade is left to Dundee. Shipments from Calcutta to Argentina take three or four months and the goods may be required in three or four weeks.

In India they make their own machinery in part, but the great bulk has been supplied from England and Scotland, except for renewals. The Dundee trade with India is in "fine or special jute goods, not yet produced therein. Cocoa matting and door mats are increasingly imported into British markets from India below British cost price. India also competes in sacks and bags, which, it is said, can be sold at rates averaging about 20 per cent below those of British-made goods. The dependence of the Scottish jute trade upon India for raw material is viewed with some uneasiness, for disaster in India would ruin the jute trade completely. The Government, it is urged, should experiment elsewhere—say in Nigeria, for it is dangerous to rely on one source of supply alone.

Thus far the Tariff Commission. I need only add that all efforts to grow jute in other countries have failed dismally. Successful substitutes are often announced, but they get no further. The Bengal District has two valuable monopolies. One is the "permanent settlement." The other is jute. And both promise to endure.

THE EXPANSION IN INDIA.

Here it may be useful to interpose some statistical material concerning Indian jute mills. An official memorandum issued recently speaks of "uninterrupted progress," and, in the broad sense, uninterrupted progress has undoubtedly occurred. But in

their early stages, jute mills met with various vicissitudes. Indeed, one authoritative writer, reviewing the outlook in 1880, came to somewhat gloomy conclusions. "Few industries," asserted this discouraged observer, "have so rapidly expanded and with such little benefit to the projectors, as the jute mills of Bengal. Not a decade ago (*viz.*, in 1870) the jute mills did not exceed five in number, with about a thousand looms at the outside. Their number now (in 1880) is twenty, with 4,800 looms, representing an invested capital of over 2½ million sterling. The large profits made by these five pioneers of the industry tempted others to try their fortune also. *Carpe diem* was the maxim of these company promoters....The careful and skilled supervision, the prudent and economical management, the results of matured experience only acquired by years of training in and study of the trade, were here only rarely to be found, and as a necessary sequence the high profits which were only

made in years of exceptionally good business and high prices of gunnies have now, we are afraid, for ever disappeared; the dividends have become smaller and beautifully less, and the sun of many a concern has now, we fear, sunk for ever beneath the dividend horizon, leaving nothing but debenture debts behind," etc.

To-day another period of high profits for jute mills is in session, and when further expansion is planned, it is useful to look back and note what progress occurred in previous years when financial and trade prospects lacked their present brilliant hue. The following statement shows quinquennial averages from the earliest year for which complete information is available with actuals for 1914-15, 1915-16, and 1916-17. It will be seen that the number of looms and spindles in operation and that of persons employed have increased to a very much larger extent than either the number of mills at work or the amount of capital employed.

				Mills at work.	Auth. capital in lakhs of Rs.	Number (in thousands) of	
						Looms.	Spindles.
1879-80 to 1883-84 (average)	...	...	...	21	270·7	5·5	88
1884-85 to 1888-89	„	...	...	24	341·6	7	138·4
1889-90 to 1893-94	„	...	...	26	402·6	8·3	172·6
1894-95 to 1898-99	„	...	...	31	522·1	11·7	244·8
1899-00 to 1903-04	„	...	...	36	680	16·2	334·6
1904-05 to 1908-09	„	...	...	46	960	24·8	510·5
1909-10 to 1913-14	„	...	...	60	1,200	33·5	691·8
1914-15	...	...	...	70	1,394·3	38·4	795·5
1915-16	...	...	...	70	1,322·6	39·9	812·4
1916-17	...	...	...	74	1,395·5	39·7	824·3

The number of employees in the foregoing period has increased from 38,000 to 262,000.

The production of the mills has increased to a still greater extent. The following figures indicate the exports of jute manufactures and the declared values for the same periods. The combined value of gunny

bags and gunny cloth exported by sea in 1916-17 is over thirty-three times as great as the average value of the exports in the period 1879-80 to 1883-84.

	Exports of jute manufactures		Value in lakhs of Rs.
	Gunny bags in millions of number.	Gunny cloth in millions of yards.	
1879-80 to 1883-84 (average)	54.9	4.4	124.9
1884-85 to 1888-89	77	15.4	162.9
1889-90 to 1893-94	111.5	41	289.3
1894-95 to 1898-99	171.2	182	518
1899-00 to 1903-04	206.5	427.2	826.5
1904-05 to 1908-09	257.8	698	1,442.7
1909-10 to 1913-14	339.1	970	2,024.8
1914-15	397.6	1,057.3	2,582
1915-16	794.1	1,192.3	3,797.8
1916-17	805	1,230.1	4,165.5

EUROPEAN JUTE MILLS.

The inherent advantages of Calcutta for jute manufacture and export are traceable in the process of consistent expansion—despite frequent periods of depression—indicated above. Calcutta mills have accumulated strong reserves, and—more fortunate than Dundee concerns—have escaped an excess profits duty. Continental mills are less favourably situated, their greatest strength being that they manufacture chiefly for “home” consumption and are protected in this monopoly by tariffs. Such mills have for three years experienced abnormal difficulties in obtaining raw material. Many have lost valuable operatives. All are bearing heavier taxation in their country of origin, and will further be called upon to bear the taxation imposed on raw jute at the port of export. High freight charges on raw material will be another difficulty. War orders will cease but high freight costs will continue. An incidental effect of the uneven

distribution of taxation recently developed has been, and will be, the transfer of sterling companies from the United Kingdom to Calcutta.

THE RAW MATERIAL.

The process of improving the quality and outturn of jute by better methods of cultivation, introduction of improved varieties, etc., is beginning to exert visible effect. It was indicated at the inter-provincial jute conference that—from 3,000,000 acres—jute is produced valued at sixty crores of rupees, equivalent to Rs. 145 per acre and contrasting with Rs. 52 per acre from rice, Rs. 36 from wheat, and Rs. 32 from cotton. The Government jute expert, Mr. Finlow, has indicated that, in his view, based upon prolonged study, there are three possible ways of extending jute cultivation: (1) By improving the yield of fibre in the present producing areas (2) By extending the cultivation of jute to other tracts where it is not at present grown (3) By the cultivation, in tracts which

are not suitable for the production of jute, of other plants whose fibre is sufficiently similar to be used as a substitute for jute. He calculates that the plains of Assam, which are, by reason of the prevailing conditions of soil and climate, peculiarly fitted for jute cultivation, are capable of supporting at least another million acres of jute without unduly straining the proportions between jute and other crops. The lack of population in much the greater part of Assam is unfortunately an almost insuperable bar in the way of any rapid expansion, and, although numbers of Bengalis from the crowded southern districts are beginning to emigrate to Assam, it would appear that by nothing short of a wholesale colonisation scheme can progress be made other than very slowly.

The extension of jute cultivation is advisable for three main reasons—(a) to meet increased demands from manufacturers; (b) to enable agricultural land to be turned to the best possible account; and (c) to ensure raw jute being placed upon the market at reasonable prices. It is erroneous to assume that inordinately high prices could, in the long run, benefit cultivators whose real gain should lie in securing better yields per acre and in growing better qualities of jute, also in avoiding adulteration. What cannot be too often insisted upon is that jute will retain its supremacy only while it can be procured at moderate prices. The Government expert has well said that “without indulging in gloomy predictions it may safely be said that India’s virtual monopoly in the production of fibres of the jute class is in much greater danger of disappearing to-day than it was ten years ago when the policy of extension was first brought forward as a serious proposition. Very little in this direction has been done in the meantime and it seems still more advisable now than it was then that the possibilities of likely tracts should be investigated both in regard to their capacity for fibre production and also the econo-

mic inducement offered by the latter as compared with others local crops.” Next to allowing jute prices to be forced up to artificial levels, we could offer no stronger inducement to production of substitutes than by restricting supplies to foreign mills by fiscal devices.

THE DANGER OF TARIFF RESTRICTIONS.

Concerning schemes for restricting export of raw jute to various countries I may be permitted to quote a paragraph I was allowed to insert upon this perilous suggestion in another journal

It read:—“Financially and industrially, the desirability of Government encouragement of jute production, in every form, has never been stronger. Both as a raw material, and as a manufactured product, jute, in the sphere of competitive industry, is India’s trump card. This is easily demonstrable. No other country can produce the raw material; and few countries can manufacture at the same low cost. As a ‘key’ industry in the military sense, the claim of jute to be an industry of more than economic significance is permanently established. The proposals to restrict exports of raw jute, it would not be difficult to show, overlook the advantage conferred on the local mills by the possession of a large margin available for diversion to local consumption in times of stress. The raw jute utilised for the manufacture of war bags consists largely of material formerly forwarded to enemy countries. It is important to remember that, without the demand fostered by these countries, the requisite jute would not have been grown. In effect, therefore, a large foreign export of raw jute constitutes a valuable reserve, too useful to be thrown away. By encouraging export, India not only retains the power to increase her own supplies, she also retains the power to cut off supplies to other quarters. To restrict export would be to encourage, for military as well as economic reasons, the manufacture of substitutes thus defeating our own ends. The three needs

of jute are better cultivation, better transport, and unrestricted markets."

MILL OPERATIVES AND WAGES.

An American official survey of jute manufacture in all its ramifications, referring to operatives and wages in Indian mills, emphasises the important circumstance that while most of the operatives in Indian jute mills are adult males, at Dundee the majority are women and girls. Children are allowed to work only half time. The following paragraphs bear the marks, upon the one hand, of absolute impartiality, and, upon the other, of careful investigation. Whether they presage establishment of a quota of American-owned jute mills at Calcutta remains to be seen. I quote:—

The total number of operatives in Indian Jute Mills (in 1913) is about 250,000 (the number steadily increasing with the rapid addition of new machinery) and the number of European assistants about 500. The European assistants have general oversight of the work and of the machinery, but the active management of the help, arranging shifts, assigning workers to the machines, etc., is carried on by natives called 'sirdars,' and the checking up of the work done and the paying off of the hands is done by native 'babus.' It is a common complaint among the workers that the sirdars and babus charge 'dasturi' equal to about a week's wages for giving a job to a new man, and also manipulate the pay rolls to swell their own profits at the expense of the workers; this system has been found difficult for the Europeans to prevent.

With few exceptions, the Indian jute mills are situated on the banks of the River Hooghly, extending a distance of some forty miles along the river above Calcutta. Each mill is in a large compound on the river bank and is built on the shed principle, having only a ground floor and large doors and windows. Most of the mills have electric lights but there are no humidifiers. A majority of the mills are operated by steam

engines, but some mills generate their own electricity for operation.

Near the mills are the 'coolie lines,' or habitations of the workers. Some live in the most insanitary hovels in the bazaars of the towns, but in order to provide for imported labor most of the mills now house a portion of their help in *pucca* brick houses, which they build at a cost of 200 to 250 rupees a room and which they rent at a nominal charge of twelve to sixteen annas per room per month. Filtered water is supplied at near by hydrants and the lines of houses have drains which are regularly flushed. Many natives prefer to live in their own bamboo huts, which are not much more than four posts in the ground, with cross pieces lashed to them at the top, and with sides and roof of matting or sometimes corrugated iron, and mud-packed floors. The natives usually crowd together and single workers usually board with some other worker who has a female relative living with him to do the cooking; the general rate for board and lodging, where the boarders and family share one room, is six rupees per month. Notwithstanding the crowded conditions under which they usually live and the low standard of living, the workers in the jute mills are usually better off and suffer less from disease than they would in most of their native municipalities, where the sanitary standard is lower.

The low standard of living is accompanied by low efficiency, and there are many drawbacks to building up a force of skilled help. There is practically no factory population, such as exists in European countries, comprising a large number of operatives trained from their youth to one particular class of work and dependent for their livelihood upon employment at such work. Most of the workers are men from distant village farms, and they can always earn a living, though on a lower scale, at their hereditary occupation. This fact, together with the increasing demand for labour in an expanding industry, accounts for the independence of the

operatives and the lax discipline that usually prevails in the jute mills of Bengal as contrasted with the Bombay cotton mills and jute mills up country.

With the expansion of the industry, up country men have come in, and the Bengali, who is constitutionally weaker and therefore less capable of standing the long hours, seems to have dropped out. The workers now come from the United Provinces, Orissa, Madras Presidency, North-west Provinces, and distant districts of Bengal, such as Dacca, Serajunge, and Behar. The larger portion of the workers seem to be Beharis and United Provinces natives. Some of the men bring their families with them, being attracted by the fact that there is suitable work for the whole family from nine years of age up, but a very large number of the men come alone. In such case his home is in the village from which he comes, not in the city in which he works; he regularly remits a portion of his wages to his wife and family at home, and he returns there periodically to look after his affairs and to obtain rest after the strain of factory life. Most of such operatives take two or three months of every year, and during the hot weather in April, May and June there is always a great scarcity of help in Indian jute mills; not infrequently the production of mills for these months is as much as 25 per cent below normal. Before the introduction of electric lights, in the nineties, the employees usually worked hard during the warm weather and took their vacation at home in the winter months, but they now usually quit work during the hot period. The position of the operative is strengthened by the fact that the labour supply is inadequate and that there is keen competition among employers to secure a full labour supply; moreover, this competition has been made keener by the growth of new factories. These two main causes—the independence of the Indian laborer owing to the fact that he possesses other and congenial means of earning a livelihood, and

the deficient labour supply—govern the whole situation.

FINANCIAL POSITION OF MILLS.

About one-half of the raw fibre produced is consumed in the Calcutta mills, and this will soon amount to two-thirds. In the period 1903-1910 the number of looms in Calcutta increased by over 85 per cent and further large extensions are projected. Mills have been able to pile up heavy reserves, reduce block accounts, etc. Formerly mills were forced to indent heavily on banking resources to finance their purchases of raw jute. Their reserves are now so heavy that interest charges on this account will be permanently lower. Not improbably, new uses will be found for jute, thus broadening the basis of production.

The Controller of Currency, in his most recent report, observes:—"A number of people resident in England, who hold shares in Indian companies, decided, in view of the great appreciation in values that has followed the general prosperity in India, to realise their profits and about £ 1½ million was remitted on this account". This, it is believed, refers largely to jute shares, thus ensuring retention of a larger proportion of mill profits locally.

To sum up, it may be observed that the Calcutta jute mill industry is the best-buttressed textile industry existent. Raw material, labour, fuel, transport and capital are all available in abundance, and ensure continuous progress. Virtually the only limit to its expansion is the quantity of raw material. Bearing in mind that jute is the only one of the six great textile fibres that is a monopoly of a single country; also bearing in mind its highly profitable nature, the complete failure, so far, to produce satisfactory substitutes, and remembering the newly-awakened desire of the Government of India to accord full scope to this country's industrial potentialities, it is, I hope, fair to assume that whatever aid is needed from Government will eventually be forthcoming. The rest of the business development needed we can safely leave to the enterprising and well-equipped men who,—and whose forefathers,—have made the industry what it is, the second greatest textile industry of the world.

SOME ECONOMIC CONDITIONS OF MADURA VILLAGES.

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F.R. ECON. S.,

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IT may be of interest to some to preface what I wish to say by a word or two on the question of method. The accompanying diagram on a scheme for the Economic Survey of a Ryotwari Village is really the work of my friend Dr. Gilbert Slater, Professor of Economics, the University of

Madras. I am only responsible for its present form. My usual method of investigation is just this—a questionnaire is arranged embodying the items and information desired as outlined in the scheme. Then with a friend, usually a man known to the village, or one or more of my own students, a visit or visits is paid to the village. A meeting is called in the Chavady by previous arrangement at which it is especially required that the Village Munsiff and Kernam, the Union President, if there is one, and the leading villagers will attend. Such a meeting is always interesting; one can generally get the information he desires, and he can confirm it or correct it by the village records and the village officials.

A SCHEME FOR THE ECONOMIC SURVEY OF A RYOTWARI VILLAGE.

No.	Division.				Description.
1.	Preliminary	...	...	...	Name of Village, Taluk, District. General Description.
2.	Population	...	...	...	Total Population. Castes. Number of homesteads. Statistics of births and deaths.
3.	Land	...	...	...	Areas: wet, dry lands. Woods and forests. Water-supply—tanks, wells. Cultivation.
4.	Occupation of Land	...	...	...	Cultivating landowners, tenants. Agricultural coolies. Rents in money or in kind. Land Revenue. Other occupations.
5.	Agriculture	...	...	...	Any help from Government Departments. Principal crops. Areas under one, two or three crops. Type of plough used. Other implements. Pumps used. Any oil engines. Stock. The feeding of animals. Manures. Pests. Cattle diseases.
6.	The Village	...	...	...	Area. Localisation of castes. Position and condition of depressed castes. Land values. Position of lands, are they contiguous—advantages.
7.	Subsidiary Industries	...	...	...	No. of industries. No. and condition of the weavers. Spinning. Other crafts.
8.	Village Trade	...	...	...	Sale of Village produce. The market. Local roads. Railway. Any co-operation in buying and selling. The trader. Rate of profits. Why not save that!
9.	Economic condition of the Village	...	...	...	Rates of wages. Current prices of staple foods. Village incomes—expenditure. Any savings, how invested. Indebtedness. Causes. Any co-operative credit, why not. Advantages. Government Loans Act. Rate of interest.
10.	Sanitary condition of the Village	...	...	...	General health, diseases, medical aid. Drinking water, bathing facilities.
11.	Education	...	...	...	No. of Schools. Educational character of schools. Attendance—how many, how long. Percentage of English and Vernacular education. Have any gone to more advanced schools, what success, any library or reading facilities.
12.	Village administration	...	...	...	Panchayat. Village—Sanitary—Police—administration. Crime. Litigation—causes and remedy.
13.	History and Prospects of the Village	...	...	...	Any economic deterioration or advance. Opportunities and future for the village. Advice.
14.	Family Budgets	...	...	...	Family budgets may be gathered showing economic condition of representative families, as to life, income, expenditure, and prospects.

It is scarcely necessary for me to describe to you in detail the main features of one of our Madura villages. I am convinced that the present condition of our villages (and any one of them is typical of nearly all the villages of the Presidency) is very well known to you. They are for the most part a mass of houses, cattle sheds, straw stacks, sheep, goats, pigs, dogs and fowls all huddled and trying to live together. The lanes and alley-ways are narrow and crooked, and are the only outlets for the sewage which pollutes the air and invites the germs of disease. These villages are not only filthy but ugly in the extreme, yet some of these hamlets are beautifully situated and if the villagers would only give a little thought and time and effort to their village they could make it—a thing of beauty and a joy for ever.

That is one of our economic problems—the unlovely and unsanitary condition of our Madura and I could say with equal force of our Madras villages. It involves health and the death-rate, it involves the spirit of contentment and enterprise, it involves efficiency and production, and as we all recognise they are foundational to economic betterment. Here is quite a striking statement from Robert Owen: “Experience must have taught you the difference between an efficiently equipped factory with its machinery always clean and in good working order and one in which the machinery is filthy and out of repair and working only with the greatest amount of friction. Now if the care which you bestow upon machinery can give you such excellent results, may you not expect equally good results from care spent upon human beings, with their infinitely superior structure? Is it not quite natural to conclude that these infinitely more delicate and complex mechanisms will also increase in force and efficiency and will be really much more economical if they are kept in good working condition and treated with a certain

measure of kindness. Such kindness would do much to remove the mental friction and irritation which always results whenever the nourishment is insufficient (and the sanitary conditions unfit) to keep the body in full productive efficiency, as well as to arrest deterioration and to prevent premature death.” Here is another striking extract from one of the Madras Government orders on Village Improvement:—

“The many difficult problems connected with congestion in Municipalities which now face Municipal Councils and will cost large sums to solve would obviously in most cases never have arisen if the growth of the Municipalities had been watched and properly directed from the time they were small villages. Yet little is being done at present to control or direct the expansion of growing villages and these are in too many cases spreading in a confused and disorderly manner which eventually need to be remedied at heavy expense. Houses (often costing considerable sums) are springing up, facing in every direction and so constructed that neither streets in front of them nor conservancy lanes behind them are possible; no provision is made for through roads connecting with existing thoroughfares; no ground is left for wells or latrines or open spaces for recreation; no account is taken of the existing or natural features of the site or of the possibility of a picturesque lay-out and the result, too often is an extension which is inconvenient and unhealthy to those who live in it, ugly in itself and a hindrance to through traffic to the parent village.”

Now, what is to be done? The solution of the problem is along the lines of Village Planning. The time has fully come when the lay-out of villages and the extension of larger towns must be adequately supervised. Municipal Councils and District Boards should be instructed and empowered by Government to insist upon sanitation and health, pure air and good water in our villages. Through the kindness of Mr. H. F. Marker, L.C.E., Assistant Engineer, Mysore City, I place before you two suggested models of village planning. If something like that could be insisted upon in the lay-out of our villages what a beautiful and sanitary and healthful place an Indian Village would become.

THE LAND QUESTION.

We now come to the land question, and this is at once both the joy and pride of Indians and yet one of India's greatest economic problems. We have the two striking extremes—lands in abundance, and holdings too small to support a family. At the bottom of a great deal of the land question in India is the joint family system of land tenure, which results in the uneconomic division of land. India to-day is where Europe was in the Sixteenth Century. The minute sub-division of the land, says Theodore Morrison, was a universal characteristic of archaic agriculture of the Sixteenth Century and might be found all the way from the South of Spain to Siberia, by the banks of the Loire and on the plains of Muscovy. Even before the Sixteenth Century it was established almost everywhere in England and extended down to the Eighteenth Century. Is it too much to expect that changes will take place in India? In fact changes of land tenure must take place. For instance, listen to this: I learned recently of a village in which one survey field measuring only seven acres was divided into nineteen separate pieces, owned by six different pattadars. One of these pattadars held nine separate pieces of land ranging in size from nearly half an acre down to one hundredth of an acre. In another village a survey field measuring only 1.66 acres of land and paying altogether a revenue of Rs. 4-10-0 was cut up into thirty-seven minute properties. I ask what chance of success has agriculture with a system like that, or what possibility of getting a living from the land has a family on one of these small holdings!

In another one of our villages the average extent of these holdings is .77 acre, in another .80 acre. Unfortunately these minute sub-divisions are on the increase. In one Taluk the number of holdings paying Rs. 10 and under increase from 305

in the year 1900-1901 to 413 in 1913-1914; in another village between the years 1890-1891 and 1913-1914, the number of these small holdings rose from 61 to 198. I find in another village that land which thirty years ago was comprised in one holding is now split up into nine separate holdings, and there are other cases like this one.

In another village we find that out of a total of 518 pattas, 363 or two-thirds of the pattas pay less than Rs. 10, and the number of large pattas is very small. Let us take one more. In this village there are 207 pattadars. Of that number 66 pay less than Rs. 10 land tax, and the average extent of their holdings is only 56 cents. I cannot emphasise too much the fact that land paying only Rs. 10 or less will not ordinarily afford a livelihood to the owner.

That seems to me to present a serious economic situation. A half and sometimes two-thirds of our village people are trying to live on less than one acre of land. What is the cause of this? The Joint family system. What does it result in? Forced sale of patrimony, indebtedness, absenteeism, and emigration.

There is another phase of this same problem, and that is the practice of cultivation in small strips or plots. In one village, a pattadar had nine separate plots of land and the largest was less than half an acre. In another place, a holding of only one acre and a half was cut up into over thirty small pieces. I asked why do you not have your lands contiguous? The answer was custom. These sub-divisions are due to the original family partitions. The point is this—the good and bad portions are divided equally, and so no one son gets all good land and another son all bad land. Contiguous lands it is thought by the villagers would greatly increase the price of land; and so the old practice is continued. Mr. D. T. Chadwick has pointed out clearly the evils of this practice. It renders supervision of labour

MODEL VILLAGE

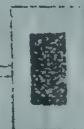
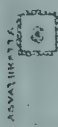
DESIGN NO. 1.

SCALE FOR 1/4" = 1'

56 HOUSES

SCALE 250'-1"

VILLAGE SCHOOL 250' x 100'



CHAVADY 250' x 100'

(50) H.P. Marker

Assistant Engineer

M-SORE CITY IMPROVEMENT TRUST BOARD

MODEL VILLAGE

DESIGN NO. 2

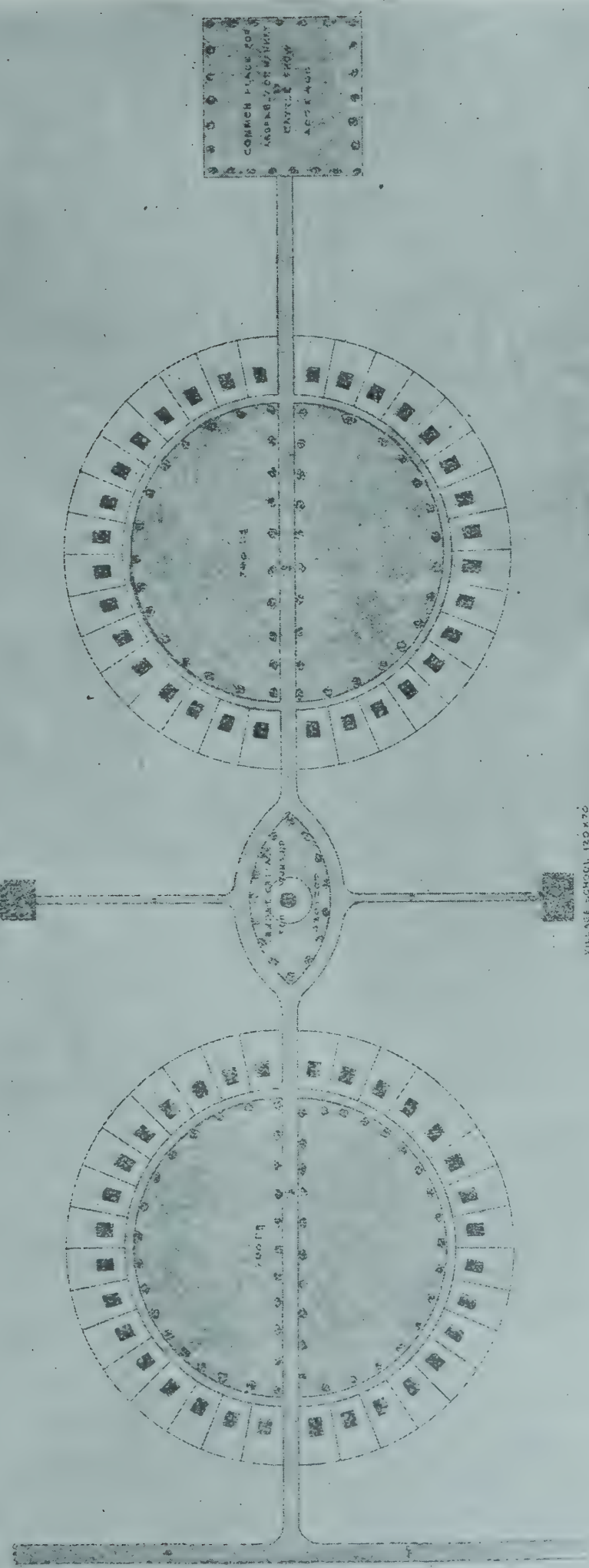
FOR

64 HOUSES

SCALE 200' = 1"

CHURCH 100' x 50'

VILLAGE SCHOOL 120' x 70'



(50) H.F. Mosher
Assistant Engineer
 WYOMING CITY IMPROVEMENT DIST. BOARD

more difficult. It means that impliments have frequently to be moved from one small patch of cultivation to another, thus wasting time and rendering the use of any but light and portable tools difficult. It makes it almost impossible for a farmer to fence his land for pasturage. It places special difficulties in the way of any farmer who wishes to cultivate a different system of cropping from his neighbours and it greatly hinders any improvement of breeding stock. A man who owns such minute fragments of land cannot go in for agricultural improvements such as sinking a well. He has to put down the same crop at the same time as his neighbours, for if he attempts a crop which remains on the ground longer than those around him, the village cattle will come in and eat it after the rest of the fields are reaped. This minute sub-division also leads to frequent disputes regarding the passage of water channels, right of access and so on, and involves much loss of actual land in subdividing ridges. An economic evil of this sort arising as it does out of the social customs of the people is peculiarly difficult to deal with, real improvement can hardly be effected without some drastic change in the Hindu law of property.

These are some of the questions in our land problem in South India to-day. What is to be done? There is only one remedy as I see it, and that is—Legislation.

THE PRINCIPLE OF CO-OPERATION.

I wish to bring before you just here a comparison between two of our Madura villages. One has a co-operative credit society, the other does not have one. The point that I want to make is—given time, the principle of co-operation will solve many of our village economic problems. Now, I recognise that co-operation is not a panacea for all our social ills. The progress and present status of one village is not all due to the spirit of co-operation and on the other hand the backwardness of the other village

is not wholly due to its having no co-operative society. There are a great many factors which operate in producing a set of economic conditions. But there are some things which are significant of co-operative influence, and of some of them I wish to speak.

I had the good fortune to have the presence and kindly help of Mr. K. Ramaswami Iyer, Secretary of the Madura-Ramnad Co-operative Bank, on these visits. Uthangudi is particularly fortunate in having a man like him as one of its landholders. He takes a great practical interest in the village and villagers. He is a student of agriculture. He is experimenting with ploughs and manures and seed and cattle and fruit. The village has an object lesson of progress before its eyes all the time, and the villagers can and do benefit by his work and kindly interest. It seems to me that is the way of progress in Indian villages. If Indian men of means and vision will go into villages, gain the respect and confidence of the villagers, and work for progress and the economic betterment of their fellows it will come, they will not lose by it, and a New India will be the result. My experience teaches me that villagers are not averse to progress, but they want demonstration of the advantages of change by those in whom they have confidence, then they will follow. Here is a splendid piece of true Missionary work which educated Indians, men of landed property can do, and I appeal to them to do it.

This little village is four miles from Madura on a main road. It has a population of almost a thousand people. It has a co-operative credit society of eighty-four members which has been in operation since 1908. All castes are represented in the society. The shares cost Rs. 2 each, and any man may not have more than twenty shares. The objects of this little society are excellent, but they are no doubt common to other villages and societies as well.

The objects of the Society shall be :—

- (1) The Co-operative purchase of seeds, manures, impliments, and other agricultural requisites for sale or distribution to members or to other Co-operative Societies and so acquire immovable property by sale or lease and to own the same.
- (2) To secure the best market for the sale of produce and to arrange for collection and sales of the produce of the members.
- (3) To buy or hire pedigree bulls and buffaloes for breeding purposes.
- (4) To arrange for all kinds of agricultural insurances.
- (5) To disseminate a knowledge of the latest improvement in agriculture and to adopt them in practice.
- (6) To take up such other work as may be conducive to agricultural development and prosperity.

The Society charges $9\frac{3}{8}$ per cent interest. Twenty years ago the money-lenders charged anywhere from 18 to 30 per cent interest. Payment in kind went as high as 50 per cent. The money-lenders' rate is now anywhere from 12 to 24 per cent, so that the influence of co-operation has resulted in a much lower rate of interest. The non-member is saved at least six per cent, while the Society member is saved up to 15 per cent on his interest payments. That saving is more clearly seen when we refer to the Loan account.

LOAN ACCOUNT.

	Loans advanced to members.	Loans repaid.	
	Principal.	Interest.	
	Rs.	Rs.	Rs.
1913-14	10,435 0 0	6,425 12 0	1,110 0 4
1914-15	7,395 0 0	6,284 0 0	1,725 2 2
1915-16	16,860 0 0	13,216 0 0	2,202 0 10
1916-17	12,825 0 0	8,453 0 0	1,494 15 0

Now by calculating average saving of 10 per cent on interest payments, we have in this little village a clear saving of over Rs. 1,000 per year due to the Credit Society.

Take another line of evidence. Ten years ago there were 150 absentee landlords owning lands in this village. These men for the most part lived in Madura. Now, there are only forty absentees, and their number is being decreased all the time. The men of the village by thrift and saving and by money loaned by their Society are acquiring these lands. What is the result? Greater interest in their lands, better cultivation, and a larger production. It is well recognised that the system of absentee or non-cultivating landlords means poor cultivation and diminishing production. Take this village of which I am speaking under absentee landlords twelve kalams of paddy only in former times could be raised, realising at the rate of Rs. 4 per kalam, Rs. 50 per acre. Even now with better methods and seed and manure twenty kalams is the best yield under absenteeism realising Rs. 80 per acre. But when the ryots own and cultivate their own lands they can get a yield of twenty-five kalams or Rs. 100 per acre, which is an increase of 20 per cent. In another village the Brahmins are losing their lands to those who cultivate them for themselves. The cultivating castes have all increased their lands. In another place none of the absentees attempt to cultivate the land themselves, they lease it to residents of the village for rent or for a share of the produce. In still another village, the Vellalas have lost more than one-third of their holdings. This caste do not cultivate their lands, but engage coolies or farm-servants to do the work for them. It is said that many a Vellala family in that village does not even take the trouble of going to the fields to supervise the work done by the farm-servants or coolies. It can easily be imagined how by such indolence and negligence their holdings will decrease and the cultivation remain poor.

Take the question of indebtedness. Our type village ten years ago carried a debt of between Rs. 60,000 and 70,000. It is true that some of this indebtedness dates back to the

days before the advent of the Periyar Irrigation scheme, but the chief reasons assigned are excessive rates of interest, bad cultivation and small yields, and consequently small incomes. The average indebtedness then was Rs. 1,500 per ryot, and 75 per cent of the villagers were debtors. What do we find to-day—the total indebtedness amounts to Rs. 25,000 of which 15,000 belongs to the Credit Society, and 10,000 is outside debts. The average indebtedness now is only Rs. 700 per ryot and only 30 per cent of the villagers are in debt. A great deal of this money is the balance on old debts, but now the villagers do not fear those old debts, they are gradually paying them off; they are, however, borrowing freely from their Society for the purpose of acquiring new lands from absentees and for cultivation purposes. I think these figures tell their own story, and it is a splendid commentary on the good results to a village of the practice of co-operation.

A few words in reference to the general appearance and social life of the village. The village is unfortunate in its lay-out. The village simply grew anyhow. There was no forethought or idea of village planning. The houses are literally huddled together. There is, however, a worthy ambition on the part of the villagers to have better houses. Years ago there were only mud huts with thatch roofs. Now, there are many brick and stone houses—two stories, some of them with tile roofs. The Credit Society lends money for this purpose on long terms. Co-operation also leads to village democracy. Panchamas may and some do have a place equal with high caste men on the managing committee. The business of the Society is conducted in the Chavady where all may meet on equal terms. This conduct of Village business by a representative committee is splendid training in self-government, and it seems to me that that is where the truest and best home rule should begin in the villages and smaller towns of

the land. In addition to lands and loans this managing committee deals with questions of village sanitation, drinking wells, roads, lighting, protection, health, education, and other social matters. Co-operation develops trust and confidence and honesty in the members. They take a just pride in being punctual in the repayment of their loans. The operation of the principle of co-operation in Indian Villages is having a wonderful uplifting influence. There is, however, unfortunately a blot on this fair picture, and that is the spread of drunkenness. The men of this little village are prosperous and doing very wisely, but for lack of something better they meet in the evenings and drink until they are drunk. That is their pastime. They have nothing else—no social centre, no library or reading room, no evening society of any description. They work hard and long in the day time and get drunk at night. Drunkenness is an economic waste. These villagers must have some special recreation, some evening occupation, and it should be of an educational nature. There is a noble and worthy work for co-operation societies and village panchayats—save the villagers from themselves in the evening time and give them opportunity for self education.

I have dwelt at some length about a little village which believes in co-operation, has practised it for several years, and has been transformed by it. Let me now take you to another small village situated in the same part of the country, having similar advantages which for the sake of comparison is identical in many respects with the village just mentioned, but which has no Co-operative Society.

Leaving Madura we pursue our way along another road travelling due north; the road is a good one. About four miles out, we come to the little hamlet of Kodikulam. It is situated around a portion of a bund of a large tank and is some 300 yards from the main road. It has only forty-two houses, with about 150 inhabitants. Its population is

increasing but slowly. There are only two pucca houses belonging to Madura people. All the others are simply mud huts with thatch roofs. The whole appearance gives the impression of primitive life, poverty, and a backward people. The holdings consist of sixty acres. The bulk of this land, or to be exact sixty acres, is held by two men absentee landlords in Madura. These villagers have no land themselves. They are simply tenants or cultivators. The villagers have no ambition to acquire lands. They are too poor. They cannot save. Their present economic condition is hopeless and they are helpless. And the pathetic thing about their situation is they realise their hopelessness, and they are giving way to drink. I was told that not one of those men whom we met that morning could be seen or questioned at night time, for they would all be drunk. What an existence, serfs or slaves of the land! No interest in life, their economic condition hopeless or almost so, and they themselves helpless in the hands of their landlords and that within four miles of a large city like Madura.

Everybody in that little village was in debt. Their indebtedness averaged from 50 to 70 Rs. a man. They borrow of their landlords, and the landlord comes at harvest time and gets his principal plus his interest at the grain heap. If the poor ryot were able to pay his interest in money he would pay only 15 to 18 per cent, but paying in kind he pays at the rate of 30 per cent and more. In fact he does not know how much he pays. The villagers are all illiterate and the children have no school. The economic conditions of that little village are the most pathetic that I have found anywhere. What can be done?

Here are two men the principal landlords. One cares nothing about the economic improvements of those villagers. He is there to make money and he is making money out of their poverty. I asked him will you sell your lands to enable these people to acquire land for themselves. He said in effect—No.

The other man is the largest landlord. He owns thirty-five acres but he would sell out tomorrow to benefit those villagers. He has a sincere desire for the economic good of those people. He is a co-operative man. Arthur Young's words are as true of that little village as of any other village or country in the world: Give a man possession of a sandy waste and he will turn it into a garden, but lease him a garden and in a few years you will find it waste. One of those poor illiterate men said—you enable us to acquire the lands we cultivate and we will then improve our economic condition. We will stop drinking; we will save our money; and we will acquire more lands. That is the only way out as I see it, for those villagers and thousands like them in all parts of South India.

But how may that be done! By the organization of Co-operative Credit Societies. The largest landlord of that little village is the Secretary of the Madura-Ramnad Co-operative Bank. Mr. K. Ramaswami Iyer has a splendid opportunity of transforming that village. He is anxious to try the experiment. He has promised to explain and demonstrate to those people the advantages of co-operation. He will lend them money at $9\frac{3}{8}$ per cent interest for the purpose of acquiring lands and he is willing to sell his lands to them. What an opportunity for them, what a splendid offer for a brahmin to make to raise Vellalas and panchamas from object poverty and dependence to peasant-proprietors, to economic betterment, and a chance in life.

That is the thing that I commend to you as economists. Co-operative Credit is the saviour of much of our village economic situation. I told you of one village which is prosperous and has been transformed largely through the good offices of co-operation. I have now related to you the dismal facts of another small village which is just about as low down as it can be. Co-operative Credit is to be applied to it.

and I for one will watch the experiment with the greatest interest and I am sincerely hopeful of good results.

OTHER QUESTIONS.

There are, of course, a number of other things which influence the economic condition of our village such as poor seed, adulteration of produce for the market, and short measures and weights; one cannot speak of them all, but I do wish just simply to mention two or three matters where great improvement ought to be made. The first is the almost universal illiteracy of our villagers. When we compare our condition with Japan it should make us hide our faces for very shame. Look at India's educational need (1916):

INDIA.

Men illiterate	Women illiterate
90%	99%
Boys at School	Girls at School
23%	5%

JAPAN.

Boys at School	Girls at School
99%	98%

What does this condition call for? Free and compulsory Primary education as soon as possible. A population of illiterate ryots in India cannot compete with the thoroughly well-educated body of agriculturists like that of Germany or Japan. You see, it is placed at such a disadvantage in not being able to learn of experiments or new methods through recent and up-to-date books and periodicals. It is wholly dependent upon oral instruction, and that is not sufficient. It lacks a general knowledge even to appreciate that instruction. One of our great economic problems in South India to-day is to educate the agricultural community. Another great need is that of capital. Agriculture is in great need of more and yet more capital. The ryot has so little that he cannot afford to risk his little for a mere chance of greater returns. And yet capital for experimental purposes must be forthcoming. The agricultural department is doing very well, but it cannot do

everything. One thing I like to see and learn in my investigations is the enterprise shown by educated Indian land-holders, individual missionaries and mission bodies and others. These men experiment and spend money to demonstrate the value of new methods. When the average ryot has seen with his own eyes the advantages of modern methods in agriculture he is quite willing to follow. That is the point—the average ryot must be shown and led. That requires capital, not his own, for he has so little, but capital from without, applied perhaps indirectly to his land. This applies to the use of manures. It must be demonstrated that a rupee's worth of manure will increase the produce from a given piece of land by two rupees. Formerly, there was not so much need for manure, because the cultivation was irregular, and the land had spells by frequent droughts. But to-day far more is being taken out of the land by better and regular cultivation. The soil must be renewed, in other words, it must be manured, that is more capital must be used.

There is another thing which I have found in our Madura villages. The system of caste has been carried even to the drinking wells. A poor panchama may not drink out of a caste well unless the water is handed to him by a caste man. I have asked the reason of it—pollution. But I ask further—do you mean that he is dirtier than the rest in the village. O no, not that, it is religious pollution. These caste distinctions cannot remain in India in the new economic order into which we are now entering.

I have brought some of the economic problems of our madura villages before you. And now let me, in conclusion, in addition to what I have already pointed out, outline in a general way some of the more important industrial and agricultural needs in India to-day.

India in our time is very largely a dependent country. It is dependent upon foreign government, foreign capital, foreign initiative,

But India will not always be so dependent. There are forces at work, ever increasing, which shall eventually lead to India's economic independence.

1. *Government initiative.*—Under the East India Company, the Government did not consider that they had a responsibility to develop the social and economic conditions of the people. But when the Crown succeeded the Company (1838) the Government began at once to enlarge its functions, and from that day until this we find an ever enlarging Government initiative in all matters of economic interest to India. The Government of India has already done an enormous amount of good work for the lasting benefit of the country by means of railways, irrigation, famine relief, education, departments of agriculture, health, industry and commerce, the development of international trade, and now commissions are at work to investigate and advise how India may benefit industrially and commercially by the upheaval of these war times.

2. *Education and training.*—Indian education up to the present has been largely literary in character. The time has come for a more definite technical training and scientific education, and our system of education must be modified to meet these pressing needs. The Government are doing splendid work in promoting industrial and technical education, but still the need is so tremendously great. No nation can become great industrially and commercially until it gives itself with zeal to the organization and training of its people for definite economic progress. That is India's task to-day, just as Europe is organized and trained for war, so India must be organized and trained for industry and commerce. The only method by which this can be accomplished is education. India's greatest task, paramount and insistent, is to direct the attention of her people to their ignorance and poverty, low ideals, yet great natural resources; and promising economic future, made possible, however, only

through definite and systematic organization and training of the nation for industry and commerce and economic advancement. Such education should be regarded as a national investment for the progress of the country.

3. *Efficiency and skilled labour.*—Why is it that so many factories and businesses fail in India after only a few months trial? The chief reason is, I think, the lack of efficient superintendence and management, and the lack of skilled and reliable labour. Of course, time and training and experience will remedy this state of things.

4. *Caste and mobility of labour.* The restrictions of caste are impossible in an industrial country. The right of change of occupation and the mobility of labour are absolutely necessary in a modern industrial state. India to be successful in the future in her competition with a country like Japan must break the fetters of caste, must develop efficiency, must have industrial ambition and enterprise, must be willing to learn of others and adopt new methods, and not to be satisfied with anything less than the very best.

5. *Capital.*—One of India's greatest industrial needs is capital. We see what can be done by well used and directed capital in the Tata Iron and Steel Works, in the Bombay cotton mills and the Bengal jute industry. But far more capital is needed to develop India's industries and agriculture. There is a ready foreign supply of capital, but India has within her own borders millions of unused and idle wealth, and vast sums are annually spent on unproductive and useless objects; if that wealth could be directed into productive industrial channels it would result in great economic good. Let India put her own vast wealth to work and supplement it with foreign capital.

6. *Higher wages.*—We know that wages are rising, but not in proportion to the rise in prices. There is a constant demand for higher wages, and that is a good sign, for it shows that the lower and poorer classes of society are feeling the pull upward of education, higher standards, ambition and religion, and they can only meet newer conditions by an increase in wages. Higher wages make possible higher standards of living. It is along these lines that the real new India will come.

FREE SECONDARY EDUCATION FOR MYSORE.

BY V. SUBRAHMANIA IYER, B.A.,

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AFTER the publication of the last article on this subject, another, or as it is generally termed, the Budget Session of the Mysore Representative Assembly was held in which the question of making Secondary Education free was discussed with considerable enthusiasm. And the debate on this occasion, it must be noted, led to a more definite understanding. The subject was once for all brought within the range of practical politics, the House signifying its willingness to vote the additional funds necessary, and a large majority recognising the need for the abolition of fees in Secondary Schools.

Now that the general principle has been thus far agreed to, the time has arrived for a consideration, in some detail, of the constructive measures. All such practical steps, it must be borne in mind, will naturally be determined to a great extent by local conditions and they cannot apply to all places, at all times. But before proceeding further, it is necessary to remove a few misconceptions which found expression in the course of the debate. The arguments advanced against the introduction of this reform were:—

- (1) that Secondary Education cannot be made free unless and until the Primary is made *completely* free;
- (2) that making Secondary Schools free would lead to so large an increase in the number of pupils as to make it impossible for the State to cope with the needs of the situation, the cost becoming prohibitive, especially because free education might spell the

extinction of fee-paying schools and the suppression of the principle of voluntary payment;

- (3) that if free education were adopted, boys and girls of the City would benefit to a greater extent than those of the country.

Now, each of these arguments is based upon a misconception.

1. That Secondary Education cannot be made free before the Primary is a view opposed not only to *fact* but also to *principle, practice* and *reason*. In the United States, they never waited for making Secondary and University Education free till the Primary was made completely free. They developed the several free courses almost independently. In Denmark, for years after the University and Secondary Education was made free, fees were being levied in the State Primary Schools. And in some of the Native States of India which have not given up the ancient Indian methods, higher grades of education were made free before the lower.

Though to superficial observers it may appear that the principle of 'free' education is the same in the Primary as in the Secondary stages, yet a little diving below the surface will show that in the case of the Primary, the fees are abolished, because of the necessity for making education *compulsory*, not because the fees are too high for the majority to pay. Whereas, in the case of the Secondary, payment is excused, partly because a majority of the pupils seeking Secondary Education are too poor to pay, but chiefly because the education of the more grown up and better trained body of young citizens brings to the State a *more immediate and appreciable return*. Such communities as realised the full significance of the latter aspect, adopted free Secondary and Higher Education, at the earliest opportunity.

Again, the countries which started by providing Primary Education gratis, and postponed the waiving of fees in the higher

stages have realized that they committed a no ordinary blunder. The number of pupils passing out of the Primary stage, in these countries, are so enormous that they find themselves at their wits end in the matter of providing the requisite number of Secondary Schools, when they seek to make *Secondary Education* free. Some of them have been compelled to defer the adoption of this measure mostly by their inability to find the requisite funds and teaching force at once. It has been so in many of the European countries though in lands like England, religious and industrial difficulties have added to the complication. On the other hand, peoples who readily profited by such sad experience of others, or who have had greater prevision, made Secondary and Higher education free earlier, *when the numbers both in the Primary and in the Higher grades were still of manageable proportions*: in other words, when the numbers were so small as to enable the State easily to provide the necessary secondary schools without any abnormal financial or other strain. They have allowed these schools to develop *pari passu* with the development of the national resources of the State.

It is true that this theory of tackling Secondary Schools after the Primary is still seriously held by some Indian educationists also. But they do not appear to have followed the trend of modern events closely enough. If the present War has taught us any great and important educational lesson, it is this. Of what current value is it to the state or the community to educate all the five to ten year old children in the primary stages even at the cost of all the wealth in the land? Can they earn for us *now*? Can they take our places *now*, if need be? Can they think for us *now*? It is such of our children as are able to add to our wages, such as are able to serve our families and our country, such as can think and act with us, *now*, not to say anything of those who may do so in the future, that can really be a support to the

state or the country at the present moment. And they come from the Secondary and the Higher stages. It is for the lack of such young men that England and some of her sister countries have been suffering. The huge sums of money which countries spend on 'free' *Primary Education* cannot bring in a return that can stand them in good stead, *in the hour of need*, though beyond all doubt such money is well spent as a preparation for the stage of usefulness.

Let us look for a moment at France in the hour of her sorest trial. Her Minister of Public Instruction introduced in 1917 a bill for *Compulsory Education* beyond the Elementary up to the age of twenty for boys and eighteen for girls. England, France, Italy and Germany are all contemplating reforms in this direction.

Further, it is meaningless, in practice, to say, that any education will ever be made *completely* free. For, there always have been, and there always will be, all the world over, some who will make voluntary payments for the education of their own children or those of their community; or at least some who would pay for having their sons and daughters educated after their own heart.

Now, should Mysore take the false step of *waiting* till all Primary Education is made *completely* free? *The right and the rational course appears to be to provide all education gratis, and to leave it entirely to the parents to pay or not.* If, however, one must take precedence of another and one must be delayed, it is the Primary that must be *delayed* and it is the Higher that must be *pushed forward* first.

Will the introduction of free Secondary Education necessarily bring in immediately so large a number of pupils as to make it impossible for the State to provide schools for them all? When Primary Education has been made, throughout a country, *compulsory*, and free Secondary Education is then introduced, *especially if the country*

be large, such difficulties as are contemplated will certainly arise. But, when Primary Education is made compulsory, only gradually, and that in limited areas and where the system has been in force only for a short time, the increase in the Secondary stages cannot but be of modest proportions.

To speak more definitely, in Mysore, for instance, there is every year the usual increase in the number of Secondary schools. And the usual provision is being made for this annually expected addition. Now, what unusual change would the waiving of fees in the Secondary schools make? Would all their classes have immediately such an accession of strength as to burst the school walls! It not, which of the classes would gain? What would be the number of those seeking admission? The answer to such questions depends, as has already been observed, upon local circumstances.

The Secondary stage consists of an upper and a lower division, either English or Vernacular. Now, very few 'English' pupils of the Lower Secondary stage have refrained in the past from proceeding to the Upper Secondary for want of means to pay the fees. For, it is mostly such as can continue their studies in the Upper Secondary English classes that bring up English. Others, especially the poorer, generally go in for the Vernacular course. The Vernacular Upper Secondary can only attract the usual number as it has been all along free and the change will not affect it. In fact it has now become necessary to induce pupils to join these classes by offering scholarships. Till, therefore, the large body of young men who have been kept back by poverty in the lower stages come up in the course of three or four years, the numbers in the Upper Secondary English classes cannot swell.

There may, however, be a few young men who have discontinued their studies in the High School forms owing to their inability to pay fees and who may now seek to

rejoin. Their exact number cannot be ascertained. However, as matters stand, hardly a single pupil who has passed the Lower Secondary stage is found without any employment. The rapid expansion of schools and the equally rapid increase of activities in other directions in the State just at the present moment have absorbed almost every available young man of this standard of education. One may not, therefore, be far wrong in inferring that the number of such young men as may be fit and as may be free to join the High Schools, if the fees be abolished, cannot be more than fifty at the highest. And these would require no more than two additional teachers.

But, in the Lower Secondary classes, the case will be different. An immediate increase may be expected inasmuch as a large number of pupils do discontinue for want of means to proceed from their village to places where higher classes exist. It is not possible to give an accurate estimate of the number of those who at present after completing the Primary stage fail to proceed to the higher classes for want of means to pay fees. Last year, a letter was addressed to over 300 representatives in different parts of the State with a view to ascertaining how many unemployed young men with primary or secondary educational qualifications stayed away without means to prosecute their studies further. No replies were expected from those who had no information to give. And those which were received showed that not more than a score of such men were to be found. This is certainly not enough evidence as regards the actual number of young men of this stand available. All the same, it shows what paucity there is of such material at the present moment. Making due allowance for those primary stage pupils who cannot prosecute their further studies for reasons other than mere poverty, the number of those who might seek admission the moment the Secondary Schools are declared free, may be set down at 500.

And they will require, on a modest average of twenty-five pupils per teacher, twenty more teachers. If a nearer approach to actual figures were required, it may be stated that even twenty-two teachers will not be needed. For, there are scores of Secondary Schools in the interior which have in the higher classes not even twenty pupils per teacher, while the standard number for each teacher is forty. Such schools can readily absorb the new comers for the next two or three years. A few of the English High Schools also have only twenty to thirty pupils to a teacher in Forms V and VI.

Lastly, as to cost, there are three items to be considered:—

- (a) The fees to be relinquished ;
- (b) The compensation to be paid to Aided Institutions ;
- (c) The additional expenses to be incurred on account of the probable special increase in the number of pupils.

(a) The *apparent* sacrifice which the Government will have to make, at first, will be that of the fee income of about Rs. 1,40,000. But the amount so relinquished will be reimbursed out of the new tax proposed to be levied.

(b) Next, as regards the Aided Institutions, the amount of compensation immediately needed would not be very large if this change were *effected gradually*. The biggest Aided Institutions are to be found in the Cities of Bangalore and Mysore and by the side of State schools. There the fear is greater that children may desert the Aided Institutions. But in the cities there are also many who have the means to pay and who would prefer to keep their children in the Aided schools for several reasons. What is needed in these places, therefore, is not a total abolition of fees but a raising of the percentage of free student-ships.

There were, in the Secondary Schools, last year 33,500 (in round figures) pupils

whose parents earned less than Rs. 16-8-0 a month, and 22,500, whose parents had a higher income. But the limit of Rs. 16-8-0 a month intended to mark off the poor, was fixed several years ago. And every one knows how costly living is at present, especially in the cities. If, therefore, we draw the line somewhere at Rs. 30, our figures, will probably be 38,000 poor and 18,000 in better circumstances. We may, then, fairly say that about two-thirds or 66 per cent should be free, because of their poverty, the remaining third being made to pay.

The compensation which may have to be paid must be determined by a number of factors such as,

- (1) The efficiency of the school,
- (2) The actual fall in the fee-income, and
- (3) Ability of the school to survive the struggle for existence.

And this requires careful investigation. A rough estimate may however be given. Free schools have not killed and will not kill the tendency to pay as has already been pointed. It was shown in the above para that only about two-thirds are really too poor to pay. We may, therefore, take it that to the extent of about two-thirds of the amount collected in the Aided Secondary Schools may eventually be lost to them on account of the proposed change. These schools collected last year Rs. 76,449 as fees. Their loss will therefore probably be about Rs. 51,000 at the *highest*. It will actually be much less, about Rs. 40,000. In all, then, an additional expenditure of not more than two lakhs is what would be required at the commencement.

(c) As regards the third item, it has been pointed out already that there cannot be immediately any appreciable increase of expenditure inasmuch as the additional pupils can easily seek admission to the existing schools with a little re-adjustment. It should be remembered that this case of Secondary Education is different from that of free *Primary* Education, inasmuch as

in the latter, a large increase would immediately follow the introduction of free and compulsory courses.

It is worthy of note that a number of Secondary Schools in the interior are starved, while the City schools are so overcrowded, as to be on the verge of inefficiency. If the privilege of free education be first extended to the interior, not only will the weak schools there gain in strength, but also will the City schools be bled to healthy sizes. And what is more, the compensation to be paid to the City Aided schools will be less heavy. As there is also a large number of very poor pupils in the cities, a larger number of free-studentships should be provided for them.

(3) Now that the Vernacular Secondary Schools exist even in some of the remotest villages and English Lower Secondary Schools in every taluk head-quarter and big village, the benefit of free education would be gained by the rural pupils of this stage to a *far larger extent* than by the pupils of cities and bigger towns. As for the pupils of the Upper Secondary stage, the advantage to the residents of cities is unavoidable. This is a necessary evil for which there exists no practicable remedy. In no country in the world has it been possible to establish a High School or a College in every village, however desirable it may be. All the same, a very large number of pupils do always come from the villages to the Upper Secondary Classes in the larger centres. And they will certainly be benefitted along with the rest.

To sum up: the situation in Mysore, in this respect, stands thus:—

I. THE URGENCY OF THE NEED.

(a) The cost of educating each University pupil in Mysore is about Rs. 893. In Bombay it is Rs. 204; in the Punjab Rs. 211; in Travancore Rs. 216; in Baroda Rs. 199; in Madras Rs. 218; and in Bengal Rs. 151. The only rational method by which this

heavy cost could be reduced is to gradually increase the number of college pupils, which demands an immediate increase in the strength of the Secondary Schools.

(b) The great demand for teachers for Primary Schools which are being opened in very large numbers, and for young men for Vocational walks of life and for Vocational Schools, which are at present poorly attended, cannot be met unless the numbers in the Secondary Schools increase at once.

II. THE IMMEDIATE SCOPE FOR REFORM.

(a) Over a hundred Lower Secondary Schools have each fewer than twenty pupils in the *highest* classes, though standard number fixed for each teacher is forty.

(b) The buildings of a number of these school are larger enough to accommodate at least thirty pupils in each class-room.

(c) The average number of pupils under each head-master of a Secondary School in Mysore is 133, while in Baroda it is 213, in Madras 326, in Bengal 149, in British India 159, in Travancore 264, in England and Wales 187 and in Scotland 349.

It follows *that without immediately increasing the cost and without detriment to efficiency more pupils could be educated in the Secondary Schools.*

III. THE OPPORTUNITY.

(a) Free and Compulsory Primary Education has been in force only for a short time and the latter only in limited areas. So the number of pupils likely to go up to the Secondary stage is still quite within manageable limits.

(b) The large number of Primary Schools which are being rapidly opened and the increased activities in other directions have absorbed almost every young man of the Upper Secondary standard, leaving only a small number of lads free to join free Secondary Schools immediately.

(c) The people are willing to pay the tax to meet the additional cost.

With the extension of Compulsory Education, the numbers will be so large that it will practically be impossible, as in England and other European countries, to introduce this reform in the near future. Delay may mean denial.

IV. WAYS AND MEANS.

The reform will cost immediately something less than Rs. 2,00,000 which amount the people are willing to pay by an additional tax.

(b) The reform cannot be effected all at once. As it has been pointed out about a third of the people are able to pay. The first step to be taken, therefore, is to make free 66 per cent of the pupils whose parents are residents of the places in which High Schools are situated inasmuch as a larger number of well-to-do parents and guardians live in such places. In the case of all Lower Secondary pupils, 75 per cent of their number may be made free.

(c) These limits may be raised in the light of further experience, the ultimate aim being always kept in view that *payment should entirely be voluntary*.

(d) This step would release a large amount of private funds now being utilised merely for the payment of fees. It could be better spent on the boarding and lodging of pupils, which would help to attract a larger number from the rural Primary to the Secondary Schools.

INDIAN FINANCE AND COMMERCE.

Calcutta, 15th May, 1918.—A competent Director of Public Instruction hampered in all directions by lack of funds! This is the impression created by the quinquennial review of education in Bengal issued by Mr. Hornell and it would not be difficult to adduce evidence that the impression is well founded. The financial difficulty is fundamental. It bars progress at every turn. The proof is overwhelming. It confronts the educationist at all points. We do not mind what aspect of the educational problem is selected the "unpopularity of the educational services." The non-fulfilment of educational responsibilities by the district boards; unsatisfactory nature and results, in many directions, of college and University education; the numerous deficiencies of secondary schools; the narrow range and notorious futility and unpopularity of Primary education: ultimately the main difficulty in securing more satisfactory conditions is lack of finance.

There was never any chance of Sir William Meyer finding large sums for education; it remains to be proved that his successor will do any better. It is at any rate a gain that Sir James Meston thinks outlay on education should be much larger than it is. He also knows, however, that new sources of income will not be easy to find. Gokhale counted on reduction of military outlay. That, of course, is now impossible. When new taxation is spoken of, the question to be decided is: taxation of what interests? We must leave this to Sir James Meston, who knows the ropes and who also realises the need of money.

In the sphere of technical education the Director of Public Instruction writes of "a quinquennium of schemes and discussions." It has been little else, far of practical

achievement there has been virtually nothing. Mr. Hornell urges curtailment of the various ambitious proposals now before Government on the following lines :—

- (a) The recruitment, as soon as possible, and the employment on the lines now contemplated by the local Government, of a Director of Industries.
- (b) The definite abandonment for the present of the Dacca University College of Engineering and the Calcutta Technological Institute scheme and a definite announcement, after settlement with the Calcutta Port Commissioners that the Sibpur College must be retained, that as early steps be taken as possible to improve the sanitation of the place and to provide adequate accommodation for the existing and increasing needs of the institution.
- (c) The removal of the Government Weaving Institute from its present inadequate and unsuitable quarters at Serampore to a suitable location within easy reach of Calcutta and the expansion of the Institute on the lines (suggested in the report) with a view to its ultimate development into a technological institute for textile industries. The expenditure involved to be defrayed in part by the industries concerned and the development of the Institute to be carried out, if possible, under the guidance of the Director of Industries, the staff of the Institute being used by the Director for his work in connection with the textile industries of the Presidency.
- (d) The elaboration by the Director of Industries of a scheme for the development of the industrial of

Eastern Bengal the scheme to follow the lines worked out by the Dacca Industrial Conference, and to centre round an Institute in Dacca.

- (e) The development of the Calcutta School of Art.

It will be wise to postpone final judgment upon these schemes until we receive the ideas and recommendations of the Industrial Commission.

The status and future of the Indian hides trade present fiscal and industrial problems of baffling complexity. Sir Henry Hedgard, an ex-president of the Upper India Chamber of Commerce, and an authority of much practical experience of the hides trade, in a recent and elaborate lecture on hides problems before the Royal Society of Arts, propounded certain views that must command respectful attention when considering what aims Government policy should pursue. I need not reiterate here the evidence attesting the high importance and magnitude of the hides trade. South India takes high rank in the sphere of hides production and handling; and Mysore takes high rank in the trade in South India. Consequently all issues concerning hides affect the prosperity of Mysore somewhat closely and it is important that local dealers should give full expression to their opinions. Otherwise their interests may be overlooked.

The nature of the decision to be taken is fairly clear. It is, in whose hands future control of the hides trade is to rest? The alternatives are also fairly evident. The first alternative is non-regulation. This would leave pre-war conditions open to restoration without official interference. Assuming this policy to find no approval, a second course would be to shut out, or regulate, transactions with countries now at war with the United Kingdom and its Allies, but to leave the hides trade otherwise open to the competition of the world. The third course, urged by Sir Henry Hedgard,

and supported, to some extent, in Calcutta, is to eliminate foreign influences entirely, confirming trading to British and Indian firms only.

The policy most likely to secure adoption is the second. Non-regulation is impossible. But equally impossible is it to penalise nationalities now our Allies. Personally I doubt that these fiscal problems are really of the first importance in relation to the hides trade. I admit their importance, but is not the effect of fiscal restriction being over-rated? I suggest that the really important questions are development of local manufacture, prevention of adulteration, etc. The interests of traders are important. But the interests of producers also invite attention, even primary attention.

The production of better classes of hides, for example, affects the prices paid to "Producers" to the extent of Rs. 3 to Rs. 4 a hide. The Board of Munitions has laid great and constant stress upon this point, and in Madras, the Government views the matter in so serious a light that it contemplates legislation penalising adulteration as a permanent measure. The primary objective, I suggest, should be development of manufacturing facilities for handling hides, not abroad, but in this country. One wants India, in short, to build up its own leather, and connected industries, to the full extent of local resources. This need, at first glance, would appear self-evident; but, in the discussions that have recently occurred, chief attention has been paid to utilisation of Indian hides by the development of manufacturing equipment in the United Kingdom, a programme for which people in this country can be expected to show little enthusiasm.

One effective means of promoting local manufacture would be the imposition of our export duty on raw hides, the proceeds whereof might, incidentally, be devoted to the promotion of such beneficial measures as prevention of adulteration, growth of new tanning materials, establishment of model

factories, etc. But to secure sound decisions upon these points, and to be able to exert decisive influence upon Government action, it is advisable that hides dealers and connected interests should be more closely organized, and, with that end in view, I venture to suggest the early establishment of of an All-India Hides Trade Federation, representing all interests, and capable of taking action to protect the hides trade from falling under the sway of regulations not entirely in local interests.

Having said this, I may add that British manufacturers would be less unsympathetic to such a policy than might be inferred. Their view, in effect is, that they want India to manufacture or semi-manufacture the leather as far as possible, and then they want any surplus raw material there may be to come to them. To this policy it is impossible to take exception. Its implication is that first attention should be given to development of manufacture of leather in India and for this policy it will not be difficult to adduce strong local support. The purchase of Indian hides for munition purposes has revealed simultaneously the vital immediate importance of this trade, and equally unmistakeably, its enormous scope for development.

The Controller of Hides controls 500 tanneries and is supplying raw material which, when fully utilised, constitutes well over 60 per cent of the footwear needed by the combined fighting forces of the British Empire and its Allies! This achievement is impressive and reveals hides as a "key" industry whose future development and control are affected, and must be governed, almost as closely by military, as by economic considerations. Next to prevention of adulteration, perhaps the greatest immediate need is development and exploitation of new tanning materials. I have it on good authority that efforts are being made to extend the cultivation of "cassia" in Madras, but these plantations will take two or three

years to mature, and—if I may quote a report I have contributed to another journal,—meanwhile tanning materials are required for current needs. The most useful discovery to date is credited to the Government tannery at Allahabad. This institution is now turning but excellent leather with new tanning materials obtained in Northern and Central India, and this achievement is really most important. The difficulty is the length of time it takes to persuade Indian tanners to utilise new processes. To secure due attention to the tanning problem two special officers have been appointed, Mr. Wood at Madras and Mr. McFarlane at Bombay. These appointments, it may be observed *en passant*, are an indication of the steady increase in the number of functions the official agency has been forced to undertake to secure efficiency.

The vital factors in the Post War conditions will be (a) the development of local manufacture, (b) the destination of surplus exports, and the aims in view in both these directions could probably best be attained by the imposition of an export tax with gradations in favour of countries friendly to India's interests. With hides, as with all other raw materials, the primary concern of Government, as of capitalists, must be development of local manufacture. To the pursuit of that aim, all other schemes must be subordinate. But to secure adoption of this policy it is essential that Indian hides interests should be thoroughly organized.

DUX.

ECONOMICS IN THE WEST.

New Industrialism of India.

London, 24th January, 1918.—India has at last come into its own. Never, I think, has there been a more remarkable and significant industrial address delivered than that emanating from Mr. H. M. Surtees Tuckwell at the Society of Arts last Thursday. In effect, Mr. Tuckwell's paper was a brilliant justification of the new Industrialism of India. True, the subject was the limited one of "the Tata Iron and Steel Works: Their origin and development." But what a host of great things is comprised within that designation! I think I am not exaggerating when I say that the facts set out in Mr. Tuckwell's luminous paper fairly staggered many of the large audience who had no conception that India has advanced so far on the road of industrial progress as is clearly indicated in the paper. Unfortunately the larger public outside are not likely to share this pleasant sensation of astonishment at India's progress. So far as I can discover the paper was very badly reported in the daily press. The weekly Trade journals will no doubt do better, but unfortunately they do not count very much from the standpoint of general publicity. What is wanted is a systematic propaganda on broad lines. The Society of Arts lecture somewhat modified would immensely interest popular audiences if associated with the highly effective slides and cinema films which were shown in the Adelphi on Thursday.

TATA IRON AND STEEL WORKS.

I have spoken of Mr. Tuckwell's paper as luminous. That certainly was its conspicuous feature. He possesses the very rare art of making a technical subject interesting without sacrificing anything of professional value. The account given of the early efforts to establish a steel industry in India under the auspices of Mr. Joseph

Marshall Heath, a retired masha civilian, was admirable as an introduction to the main theme. The facts cited illustrative of the disastrous course of the experiment set off in greater effectiveness the really wonderful character of the Tata enterprise. That one man in the face of such a record should have ventured to establish an undertaking of the necessarily vast character of the Tata Steel Works and that he and his sons should carry it to brilliant completion in so short a period are surely things which are to be reckoned amongst the romances of industry. Just a few facts to illustrate my point. When the new year dawned in 1908 a jungle in which wild beasts removed at will existed at Sakchi in the Central Provinces where now stands the Tata Iron and Steel Works, and a town associated with them which in the immediate future is expected to have a population of from 100,000 to 150,000. In 1908 India's contribution to the total world production of iron and steel was practically negligible, Indian steel being non-existent and Indian iron representing only one thousandth part of the world's total production. Last year the Tata Company paid in revenue to the Government £ 130,000; it turns out 180,000 tons of steel and 125,000 tons of pig iron per annum and will soon have machinery established which will produce 18,000 tons of steel per month; it has supplied rails for the construction of railways in Mesopotamia and so made feasible an enterprise which would have been simply impossible without India's aid; it is providing for an annual coal consumption which in the near future will be $1\frac{1}{4}$ million tons; its operations have caused an increase in railway traffic which is represented by the figure 253 million ton miles; its production of valuable by-products from the coal consumed is exceedingly large and the expectation is that when the new plant is in full working the production of benzol will reach the high figure of 2,250,000 gallons a year; it is manufacturing

a wide variety of goods hitherto almost exclusively imported from abroad and purposes largely to extend the last in the immediate future; in fine, the company has in many directions established records which are as honourable to its promoters as they are effective as tributes to the genius of the new spirit which is stirring on the industrial waters of India. India has many statues but it surely will not be content without one of Jamsetjee Nasservanjee Tata whose presence and patient persistence added to a native genius for business made these things possible.

Mr. Tuckwell's account of the early prospecting and preliminary work in connection with the foundation of the company makes fascinating reading. It seems incredible now that such rich deposits of ore as those possessed by the company had remained so long unworked. The circumstance recalls to me a visit paid me at my office in Bombay in the early eighties by a man hailing from the Central Provinces. He was an Indian born European who had lived a good time in the wild districts of what was then a most isolated region and he proposed to have made most valuable discoveries of mineralogical deposits, more especially of silver lead ore. His object was to get financiers to take up his projects, but though he came well equipped with specimens of rich ore and good credentials no one would listen to him. People simply declined to be turned from sound avenues of business to what they regarded as the shady realms of mining. That the spirit of aloofness from some forms of Indian industrial enterprise still lives or rather recently lived—is clear from Mr. Tuckwell's statements. He tells us that "when some years before steel company was established their consulting engineer met in conference a number of railway magnates and experts, he was told that steel rails could never be made in India from indigenous materials." Never to prophesy unless you know is a particularly good maxim in the industrial sphere. Certainly there was something which was peculiarly foolish and even arrogant in the attitude maintained by many in Europe to the idea that certain branches of Western manufacture were impossible in Eastern countries.

RESEARCH INSTITUTE AT BANGALORE.

A reference to the establishment of the Research Institute at Bangalore figured prominently in this branch of Mr. Tuckwell's paper. As the subject will be of special interest to my readers I may be permitted to cite the passage in full. After stating that the results of expert investigations in Europe and America were carefully studied with a view of determining how far Western practice might be adopted in India the lecturer proceeded:—

The information thus obtained was devoted to the establishment of a research laboratory at Bangalore, endowed by Mr. Tata with thirty lacs, or £200,000. The site was given by the Maharaja of Mysore, and the further financial assistance by the Government of India. The equipment was to include: (1) Scientific and technical, (2) medical, and (3) philosophical and educational laboratories, together with libraries, museum and other essential factors, and in 1911 actual work commenced. Fate decreed that the originator of the scheme should not live to realise the ambitions of his life. Dryden has said, "Pioneers from Moses onward, see yet cannot achieve their aims, but they make God's kingdom possible," and often, as in this case, their successors carry on their work. Mr. Tata's two sons and his cousin and partner, Mr. R. D. Tata, assumed the mission which had survived its founder, and their determined energy and whole-hearted co-operation have been rewarded by the consummation of Mr. Tata's three ideals. To-day the research laboratory, after a chequered period of constructional and preliminary difficulties, is now in full operation, and, according to Mr. Chatterton, Director of Industry at Mysore, the work of that institute in 1915-16 has in its industrial results more than repaid to India the whole of the outlay expended upon it.

A MYSORE ENTERPRISE.

Another passage in the address which must not be omitted is the following reference to a familiar Mysore enterprise:—

"A very interesting experiment is shortly to be tried in Mysore. The Government of that State have decided to erect a charcoal blast furnace, and have appointed Mr. Perin as their consulting engineer. He has placed orders for the equipment in

America, and the undertaking is to be managed by the Tata Iron and Steel Company. It is proposed to fell and transport timber from the vast forests of Kadur and Shimoga, and convert it into charcoal at Benkipur. Iron ore will be mined at a distance of twenty-five miles, and a high-grade charcoal iron produced. It is also intended that acetate of lime, alcohol and other by-products will be extracted, and calcium carbide may be manufactured, using the breeze or such portions of the charcoal as cannot be used in the blast furnace. The plant will be constructed and run by the Tata Iron and Steel Company."

A NEW IMPULSE.

What I have written will give a fair impression of the profoundly interesting character of Mr. Tuckwell's paper. There can be no doubt that it will have its effect on expert opinion here. I am told that amongst the audience on Thursday were several of the leading figures in the great engineering firm of Armstrong and they are just the type of men to appreciate a really big thing when it is brought to their notice. As for the influence that this new departure will have on India's industrial development can it be doubted that it will be very far reaching? Lord Sydenham, a highly competent witness is, at all events, convinced of the highly beneficial effect of the enterprise. "It is not too much to say," he wrote, "that Messrs. Tata have given a new impulse to Indian industries, which will have incalculable results in the near future. The hydro-electric installation in the Bombay Presidency is the finest of its kind in the world, and it has proved what Indian capital can accomplish under wise and sound direction."

"What India needs most at the present time" Lord Sydenham proceeded "is industrial" leaders like the Tata family, who by their enterprise and the confidence they inspire can turn to account the immense resources of the country and spread prosperity far and wide among the people." Lord Sydenham is unquestionably right in his estimate of India's needs. It is inspiring leadership like that of the Tatas which is required to give India that eminent position in the world as an industrial country which she rightly deserves.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

The Ceaseless Cry for Potash.

Washington, D. C., U.S.A., February, 3rd, 1918.—Everybody knows that there is plenty of potash in the earth, and the price tells us that there is next to none to be had. Before we go any further let's see what this "K 20 basis" is that they always bring in when they talk of potash. K 20 is potassium oxide that can be produced, but not kept, save in sealed tubes. There's water in the air all the time, and one molecule or unit of water will combine with one molecule or unit K 20 to make two quarts of caustic potash. It means the element in a soluble combination and it offers a basis for figuring. The amount of K 20 to a ton of potash salts varies according to the chloride, sulphate, carbonate, etc., contained in it.

Now, let us consider a new source, known as "greensand," and which is green sand. The deposit extends along about twenty miles of the Atlantic coast. It is known as glauconite, which is a double silicate of potassium and iron. The average content is 3 to 8 per cent of potash. There's enough potash in those sands to supply the whole world for a long time.

The trick that has been turned is one that we have been wanting for a long time. This raw material is a compound silicate, and insoluble. The only way to tear it apart chemically seemed to be to go at it with the electric arc and that requires too much power for economical production. That is why the great deposits of feldspar in this country have not rescued us from the potash famine. It was an electro-chemical process, and electricity is expensive in the great currents required.

Two chemists got busy on the green sand, and the results are so promising that the

priority board has under consideration the release of steel to build a 20 ton plant. They have patented a process which works somewhat after this fashion: Put green sand into a boiler with water and an amount of lime to offset the potash in the sand. Heat it up to a pressure of 225 pounds. Within three hours the lime will have taken the place of the potash in the sand and the potash will be in solution. The solution is drawn off and boiled down in multiple effect evaporators to a solution of caustic potash of any desired strength. If chloride of potash is wanted put calcium chloride into the boiler; if the carbonate is wanted run carbonic acid gas through the solution.

The residue is a double silicate of iron and lime. This has the properties of cement. Mixed with sand and steam hardened it becomes almost as hard as granite, and absorbs less than 5 per cent of water. It is available for sewer pipe, roofing tile, as a substitute for terra cotta, and it makes wonderfully hard brick.

BETTER COTTON BALES.

The cotton bale bulks over—large at present—it is taking up too much room in our freight cars and ocean chipping. Transportation space is at a premium, and raw cotton, as we carry it now, demands a disproportionate share of it. But cotton must be moved in order to supply the basis of explosives and vitally needed textiles both for our allies and for our fighting men at home and abroad.

Our way of handling cotton in transit has entailed an annual loss heretofore of quite \$75,000,000 between its departure from the producer and its arrival at the cotton mills. To-day, with cotton high, the yearly sacrifice is close to \$100,000,000. The primary cause of this wastage is the comparatively crude fashion in which our native staple is generally baled. A far bigger monetary loss confronts us because

of present freight rates and the scarcity of cars and bottoms.

The run of plantation bales, as they are shipped from the gin, have a density of eleven pounds per cubic foot, and on an average twenty-five of these fill an ordinary car. After recompression and strapping at the nearest railroad compress, their bulk is so reduced that two cars will hold one hundred bales of a density then of twenty-two pounds per cubic foot. The more improved apparatus turns out square bales, covered with burlap and carefully strapped, that have a density of from twenty-eight to thirty-five pounds per cubic foot, and thus effect a material saving in car or hold space. If our cotton were baled as it is elsewhere, particularly in the far east, one car could easily accommodate one hundred bales, thus releasing, for other uses, half the cars now required.

It has always been argued here that high compression damages the staple. This objection, it is now coming to be seen, has no foundation in fact. The United States Department of Agriculture has given this matter most careful study; and its experts have reported that the increased density does not affect the grade of the cotton. After removal from a densely packed bale the cotton was found to recover its original appearance in the course of twenty-four to forty-eight hours, and upon further examination was found to be in no wise injured.

According to the latest governmental figures, our railroads moved, in 1915, no fewer than 5,012,705 short tons of cotton; and in 1916 we exported 1,542,035 tons of the staple. Prior to the 1st of November, 1917, the cotton ginned in the United States amounted to 7,150,254 bales. In a single season we have shipped to Europe as many as 8,000,000 bales; but at the present time our exports are not in excess of 6,000,000 bales.

NEW KEROSENE-BURNING FARM TRACTOR.

The manufacturer of a very popular small American automobile has developed a small farm tractor which is to be produced at the present time at the rate of fifty per day, and which will be sold at a very low price. It is anticipated that it will sell all over the world. The same methods of quantity production are being followed as in the famous car made by the same concern. The new tractor has numerous features of interest, and is of simple and substantial construction. It is especially designed with a view to using kerosene as fuel and it is said that changes may be easily made that will enable it to run on alcohol. The tractor has no frame such as the conventional machines are fitted with, but the engine, change-speed gearing and rear-axle housing are all bolted together to form a unit which replaces the frame of the ordinary tractor, as the axles are attached to this unit as well as the other necessary appliances. Ignition current is obtained by a novel form of flywheel magneto which has been developed on the passenger cars built by the same maker. The engine is of four-cylinder, four-cycle type, and drives a sliding gear transmission through the medium of a disc clutch. The drive to the rear axle is of the worm-gear type, so that all change-speed gearing run in an oil bath and are also completely protected from dirt and grit, which cannot always be said of similar members in tractors of more conventional design. The rear wheels are 42 inches in diameter and the front wheels 2 feet 4 inches in diameter.

The entire machine weighs but 2,500 pounds. The machine is capable of exerting a drawbar pull of 1,500 pounds, which is sufficient to pull two ploughshares in very heavy soil when working on an intermediate speed of 2.7 miles per hour. The machine will turn in a circle, having a

radius of 21 feet. The four-cylinder engine has a 4-inch bore and a 5-inch stroke, and is rated at 22 horse power at 1,000 revolutions per minute. This power rating is obtained with the low compression pressure necessary to use kerosene properly. The fuel supply is carried in a 23 gallon tank mounted over the engine and supported at the front end by an extension of the radiator and at the rear end by a simple band iron frame. As gasolene is used for starting, a small tank holding a quart is provided. The kerosene is turned on only when the engine has become properly heated. In order to simplify the construction the thermosyphon system of cooling is used, the engine being provided with exceptionally large water jackets and the water system having a capacity of eleven gallons.

The design has been very carefully considered with a view to quantity production, and it is expected that it will be marketed at a price that will bring within the reach of the small farm owner in all countries, who heretofore has been unable to purchase reliable tractor at a reasonable price.

CONVERTING ELECTRICITY INTO STEAM.

There has just been invented here a new type of electrical steam generator. The essential idea in the apparatus is the direct conversion of electric energy into heat by making use of the resistance of the water to be evaporated. Alternating circuits of 200 to 3,600 volts can be applied, and this apparatus is stated to be automatic and to require no regulation, whatever. Lack of feed water merely diminishes the production of steam until the supply of water is renewed. The efficiency is claimed to be 97 to 98 per cent. The newly-contrived apparatus is constructed to work at pressures of fourteen atmospheres, and can be connected up at any time to the steam pipes of an ordinary boiler. In this way temporary use can be made of

hydro-electric supplies, and their utility can be judged by the fact that they were often used even before the war when the price of coal did not exceed \$8.00 per ton. The production of steam varies according to the area of the electrodes immersed. The sediment collecting at the base of the apparatus from water containing calcareous material can be released without interrupting the process.

TIN SCARCITY—AND ITS RECOVERY.

The humble tin can is coming into its own. Tin in the form of pigs has sold in the last month at the highest price in history—from 75 to 85 cents per pound. In view of its present scarcity and high price methods of recovering it from old cans and tin scrap are receiving much attention, and there has just been devised a practical and profitable method of utilizing the empty tins that form a part of the refuse everywhere. An important advantage of the process seems to be that it can be carried on with very little expense by municipalities that maintain an incinerator for the destruction of waste material. Its chief feature is a special furnace for the treatment of waste tin by gases, which can be added to the existing plant and worked in conjunction therewith, with only a trifling additional outlay in fuel and labor. While detinning, desoldering and baling are not new, the novelty in the process adopted is that the detinning—that is, burning the tin off the steel—is done by means of heat from waste flue gases on their passage from the furnace to the chimney, thereby reducing the cost of a separate and specially fired furnace. The process involves only a comparatively money outlay, the hydraulic pressure being already installed at the works in connection with other machinery.

The cans are detinned by heat. They are sorted out and dropped into a furnace, through which the flue gases are allowed

to pass. The heat melts off the solder, which falls off into a collecting trough. The cans are then removed and put through a hydraulic press and formed into bales. When removed no banding is necessary, as the bales hold together in such a way that they can be put into a wagon and thence taken to railroad cars for delivery to the steel works. The solder that is collected in the trough has necessarily a certain quantity of dross in it, from which it has to be separated to find a ready market. The light scrap is merely sorted out and baled without treatment of any kind and similarly forwarded to the steel works. The galvanized scrap is baled without treatment and delivered to degalvanizing works. The enamel scrap has to be specially treated by firms dealing in such material, who remove the enamel and recover the steel.

AMERICAN TRIUMPHS IN CHEMISTRY.

It took nearly one hundred years for Germany to build up her chemical industries to the place they held at the outbreak of the war. In three years American chemists have done as much as Germany has accomplished in nearly a century. We have had to do without German chemicals formerly considered indispensable, and we have discovered that they can be produced here or substitutes found. The past three years will affect the chemical industry of the country and the world for a century to come.

Prior to the war 74 per cent of the dyes used in this country came from Germany; the rest were made here by German permission. When German imports were cut off American chemists got busy, and now American-made dyes meet nearly all trade requirements. In 1914 there were five concerns making aniline dye-stuffs in this country, and a mere handful of manufacturers of the crudes and intermediates. To-day there are over ninety of the latter and over eighty of the former, and the list is

growing rapidly. Practically a full line of direct, acid, basic and chrome colors are now being made in the United States, including all the fundamental needs of the textile industry, the varnish and wood-staining trade, and a great many other important lines. American colors to-day compare well with the best imported colors, alike as regards brilliancy, fastness to washing and to light, and general wearing qualities.

Nor have our activities stopped with the production of dye-stuffs. All absolutely unprepared, the chemists of this country have been called upon to produce in enormous quantities munitions for the fighting forces, including itself. They have been held to very exacting standards, and in every case they have met the issue successfully.

Since the declaration of war against Germany our chemists have been asked to find substitutes for many metals not now available. Many new alloys have therefore come into use of which we probably would never have heard had it not been for the necessities of war. Further, nitric acid, a first pre-requisite of war and agriculture, is usually obtained by subjecting nitrate of soda to certain chemical processes. This raw material exists largely in Chile, South America. American chemists, as a measure of protection should the supply be cut off, are now producing atmospheric acid, with every indication that in the very near future the output will fully equal the demand.

ALFRED T. MARKS.

NOTES.

An official statement has been made to the Ceylon press respecting the mineral survey which has been conducted in Ceylon in co-operation with the Imperial Institute. The survey, it is stated, has led to the discovery of beach deposits of monazite sand which will usefully supplement the commercial supplies of thorium required for the manufacture of incandescent gas mantles. Samples of the sand have been investigated by the Imperial Institute, and the results have been so promising that the Ceylon Government has arranged to work the deposits. Details of the arrangements are not yet available, but suitable British concentrating machinery has been selected by the Institute for the purpose, after experimental trials, and will shortly be shipped to Ceylon. At one time the monazite deposits in Brazil were the only commercial source of supply of thorium, and these were controlled by the German Thorium Syndicate. The monopoly enjoyed by this Syndicate was subsequently threatened by the discovery of extensive deposits of monazite in the Native State of Travancore in India, which are so rich that samples examined by the Imperial Institute were found to contain nearly twice as much thorium as the Brazilian monazite. The German Syndicate, however, obtained control of the company formed to work the Indian deposits, and they continued to exercise a dominating influence over the industry until the outbreak of the war. Since then the company has been reconstructed and given a British character, and it is understood that another portion of the deposits in Travancore has been taken up and will be worked by a second British company. The work of the mineral survey has shown that Ceylon can furnish several other thorium minerals besides monazite. Among these is thorianite, the richest known source of thorium. This new mineral when it was put on the market was sold in Ceylon

at as high a rate as £ 1,600 per ton, but the deposits have proved to be limited.

We note from the Report on the Administration of the Bombay Presidency for the year 1916-17:—The number of cotton mills working in the Presidency increased by five. The output of woven goods showed a substantial rise, but that of yarn decreased, owing, to some extent at least, to finer counts having been spun. The year was one of exceptional prosperity for the weaving industry. New markets opened owing to the curtailment of the import of piece-goods from Europe and the success of the British forces in Mesopotamia and in German East Africa. The revenue collected under the Cotton Duties Act was lower than last year, but this was due mainly to assessment work not being completed in time through inadequacy of establishment. The effect of the war was felt in the high prices and shortage of materials from abroad but lessened competition and new markets more than counterbalanced any difficulties of this sort and the cotton mill industry enjoyed a year of exceptional prosperity. The smaller industries in the Presidency were in many cases adversely affected by the war. The match-making industry was seriously handicapped by the impossibility of obtaining the necessary chemicals and of withstanding Japanese competition in its present state of development and the factories at Belgaum, Karad and Dharwar did not work at all. The glass factory at Talegaon turned out work valued at Rs. 20,100. Flour and oil mills did well generally and the ginning and pressing factories had a very good year, specially in Gujarat and Dharwar, and rose in number by fifty-four. A few industries continued to benefit by the war, as, for instance, the glass bangle factory at Kapadwanj and some soap factories. On the other hand, the hand-loom weaving industry was seriously affected by the high prices of yarn and dyes, and the copper and brass pot and gold and silver thread industries by the high prices of their raw material. The scarcity and dearness of dyes interfered with the dyeing industry everywhere and with a number of other minor industries such as lacquer work and hand printing. The paper mills in Poona district worked at full pressure and turned out paper valued at over Rs. 2 lakhs.

GLEANINGS.

The activities of a Bombay corporation headed by the Hon. Mr. Lallubhai Samaldas known as the All-India Industrial Syndicate Ltd., have extended to Burma. Mr. M. D. Sumana, who is on a visit to Burma, has spent some time in the Toungoo district, Central Burma, in connection with the paper pulp industry. He stated in an interview to a *Rangoon Times* representative that although Messrs. Jamal Brothers' application for the sole monopoly to extract bamboos in Burma for paper pulp had been vetoed by the Government of India, the syndicate have been promised a right to extract bamboos in a tract of land, in Toungoo district between the Kabog and Sittang districts, which the local Government have promised sympathetically to consider. It is the intention of the syndicate to crush the bamboo by their own special process, make it into pulp and export the pulp in bulk to paper manufacturers at Home for treatment. The pulp obtained, he states, is of excellent quality, and good white paper can be made from it. It is as good as exported pulp, and the polymorphic species of bamboo obtainable here makes the proposition essentially a commercial one and has a high chance of success. The difficulty of bamboo knots has been got over. There was a deal of preliminary work to be done and he did not think a start would be made till 1920, when he hoped the situation at Home would be eased for securing machinery. The syndicate proposed to work certain selected areas of a reserved tract and have been provisionally promised the sole right of extraction in these areas. It is proposed to put down in the Toungoo district about thirty pulp making depôts. It is understood that the managing agents of the Titaghur Mills have selected an area in the Pegu district, Burma, for similar operations, and

some time ago Messrs. Heilger's representative, together with the Forest Economist, visited Burma to make a further report on the matter.

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In a lecture before the London School of Economics on November 16th, 1917, Mr. Sydney Johnstone, of the Scientific and Technical Research Department of the Imperial Institute, pointed out that almost all the rarer key-metals can be obtained within the British Empire. Tungsten is obtainable from Burma (now the most important producing centre in the world), Queensland and elsewhere, and the Empire provides 35 per cent of the world production. The metal is also now being extracted successfully in the United Kingdom. Molybdenum is another metal which the Empire produces in adequate supply. Both are of great value for special armament steels and for high-speed tools. The monazite deposits in Travancore and Ceylon are the richest in thoria known, and contain abundant supplies of ceria, the other chief rare earth required for incandescent mantles. Ferrocerium, an alloy of iron and cerium, has useful applications for pyrophoric automatic lighters, and has been employed for tracing the flight of shells. Practically the only valuable keymetal which the Empire can only produce at present in very small quantities is platinum. It was suggested, however, that much larger quantities of this might be obtained in certain metallurgical workings in Canada, from which platinum, palladium and other rare metals could be derived as a by-product.

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The Department of Overseas Trade has been informed through a reliable channel, says the *Board of Trade Journal*, that a Spanish firm is manufacturing "wool" from cork, which, it is claimed, may with advantage be substituted for natural wool in the manufacture of mattresses, pillows, quilts, etc. This material is stated to be cleaner

and lighter than wool. Delivery is made in bales of thirty kilogs., the packing for each bale weighing about two kilogs., and the price asked is 2.50 pesetas per kilog. on wagons, free of charge for packing, but counting the gross for net weight. In this connection the Department of Overseas Trade has also received from the same source information relative to a Spanish process for utilising cork as a textile material. The cork is employed in the form of very fine pellicles, of which fourteen go to make the thickness of a millimetre (.03937 inch). It is first treated with chemicals to remove any resinous substances, and to render it flexible and less likely to break. The rock is then sewn between two cotton sheets and pressed several times. Kilogramme = 2.2046 lb. Peseta = 1s. (at present exchange).

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Since the beginning of the year numerous cotton-spinning companies in Lancashire have taken stock for the three and six months ending December 31, and the figures announced have shown large profits. Mr. Frederick W. Tattersall, of Manchester, has prepared an analysis of the returns published by twenty leading companies. The share capital of these concerns amounts to £728,235 and loan capital to £259,796. All the companies have made a profit, and on share capital the average profit works out at nearly 18 per cent per annum, whilst on share and loan capital combined the profit is over 13 per cent per annum after allowing interest on loans. It may be said that a similar analysis of the figures reported at the end of last June showed a profit of over 9 per cent per annum on share capital and a profit of nearly 7 per cent per annum on share and loan capital combined after allowing interest on loans. The machinery in these mills totals to nearly 2,000,000 spinners. Spinners have long order lists at a healthy margin of profit, and future stock-taking results are expected to be encouraging.

In the Report on the Administration of the Central Provinces and Behar for the year 1916-17, it is stated that the output of manganese rose from 352,969 tons to 517,090 tons. The increase was distributed over all the principal manganese districts and was due to the strong demand for manganese for the manufacture of munitions and war materials for British and French steel works and for those American firms which signed the British agreement. The Provincial average price of the ore rose from Rs. 4-2-0 to Rs. 8-8-1 per ton. Although much of the increase was swallowed up by heavy freights and working expenses, and some of the less favourably circumstanced mines made profits little above their average, the future of the industry seems firmly secured for some years to come. The number of employees in the manganese mines rose from 8,903 in 1915 to 13,350 during the year under report.

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Successful experiments in manufacturing paper pulp out of "lalang" grass are reported from Queensland, says the *Popular Science Siftings*. It resembles very closely the "esparto" of Spain and North Africa, and when dried before making it into pulp it yields as high as 60 per cent of first-class paper-making pulp. The expert states that esparto is the best pulp known, and the lalang grass product is within 10 per cent of the same value. There are millions of tons of this grass growing in Queensland. Three crops a year can be cut from it, and this plant is said to be otherwise a curse to the country. Chinese "barr" (*Urena*) and the Queensland hemp (*Sida Betusa*) are said to produce 30 per cent of first class paper pulp. Lantana, which is also regarded as a great pest, makes an excellent wrapping paper.

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A daily air postal service will probably be established between Sweden and Finland.

TOPICS FROM ECONOMIC PERIODICALS.

NEW JOINT DEPARTMENT OF BOARD OF TRADE AND FOREIGN OFFICE.

Organization and Aims.

The following appears in the *Board of Trade Journal* :—

Sir Arthur Steel-Maitland, M.P., who represents in Parliament the new joint Department of the Board of Trade and Foreign Office which has been formed to deal with commercial intelligence and with the promotion of overseas trade, received on the 6th December a deputation composed of representatives of the General and Trade Press, to whom he explained the organization and aims of the Department. He dealt with the origin of the joint Department, referring to the scheme set forth in the Memorandum on the Future Organization of Commercial Intelligence, issued by the Board of Trade and the Foreign Office early in September, and explained that it comprised the former Department of Commercial Intelligence of the Board of Trade, the War Trade Intelligence Department, and a section of the Foreign Trade Department of the Foreign Office. The rest of the Foreign Trade Department, which dealt with its main duties in relation to trading with the enemy and the formation of the statutory list, was to remain in charge, as at present, of Sir Ernest Pollock. Sir Arthur also explained that the Commercial and Consular Departments of the Foreign Office, though not at present incorporated in the joint Department, had been placed under him as Parliamentary Under Secretary in Foreign Office, and would be definitely assimilated when adequate accommodation for the entire new Department had been obtained near the Foreign Office. He went on to say that the new Department was organized into divisions, the principal being the Overseas Division, the United Kingdom Division, and the Exhibitions Division. The Overseas Division was organized in geographical sub-sections, while the United Kingdom Division was sub-divided according to trades and industries. The new Department, he explained, would not only collect information but would also take action in matters relating to trade and commerce overseas. Its sphere of action had been carefully delimited, in order to avoid any overlapping of functions with the Board of Trade proper on the one hand, and the Foreign Office proper on the other hand. Problems of general application concerning all trades and

industries, or large groups of trades and industries, in the country, such as commercial treaties, etc., would be dealt with by the Board of Trade, while business matters which became predominantly political and were not merely commercial would be dealt with by the Political Department of the Foreign Office, the new Department being consulted on the commercial side of the business. It was also intended to appoint an Advisory Committee representing business interests to assist the Department. Referring to the intelligence services overseas, Sir Arthur said that the Trade Commissioner Service within the Empire had been increased from four to sixteen officers and extended to cover India and some of the Crown Colonies and Protectorates, as well as the Self-Governing Dominions. The Commercial Attaché Service was also being reorganized and greatly increased in numbers. The control of these two services had been handed over to the new Department. The improvement of the Consular Service was also being dealt with. The latter service was not as yet under the control of the new Department, but had been placed under his personal charge as Parliamentary Under Secretary in the Foreign Office. He also announced that a complete change would be made in the "Board of Trade Journal."

THE TRADE COMMISSIONER SERVICE.

Origin and Purpose.

We take the following from the *Board of Trade Journal*.

The war, instead of exercising a disruptive influence on the British Empire as predicted and hoped by the enemy, has led to a keener realisation of the strength of the ties, both moral and material, which bind the various portions of the Empire together. Out of this realisation has sprung a growing consciousness of the need for a closer co-operation in all things that matter between the States of which the Empire is composed. It is appropriate that at such a time comprehensive action should be taken with the direct object of fostering and developing inter-Imperial trade. The recent establishment of the Department of Overseas Trade (Development and Intelligence) and the improved and extended service which it will provide at home is a necessary preliminary to any such action; for an intelligent development of trade relations within the Empire must depend upon the fullest possible knowledge of industrial requirements and industrial capabilities in this country. The

reorganization in the United Kingdom is to be supplemented by a large extension of the service of His Majesty's Trade Commissioners in the Empire.

ORIGIN OF THE TRADE COMMISSIONER SERVICE.

The Trade Commissioner Service is of recent origin. At the Imperial Conference of 1907, Sir Joseph Ward, Prime Minister of New Zealand, called attention to the need for official commercial representation of the United Kingdom in the self-governing Dominions. Mr. Lloyd George, then President of the Board of Trade, was able to inform the Conference a few days afterwards, that arrangements for the appointment of such officers were being made. The measures which were subsequently taken resulted in the institution, in 1908, of the present service of four Trade Commissioners, one being appointed for Canada and Newfoundland, and one each for Australia, New Zealand and South Africa. Each Trade Commissioner has the assistance of a number of Imperial Trade Correspondents situated in various districts of the Dominion concerned. In India and the Crown Colonies and Protectorates the Board of Trade have had the benefit of the assistance of trade correspondents, mainly officials of the local government, who have acted in an honorary capacity.

FUNCTIONS OF THE TRADE COMMISSIONERS.

The four Trade Commissioners have had a difficult task. They were pioneers in a new enterprise; it may well be that at first they felt their position to be a somewhat isolated one; and pioneer work is necessarily attended by disappointments. It was only by degrees, as the practical value of their assistance and advice became known to manufacturers and traders in the United Kingdom and the Dominions, that their activities began to bring about increasingly useful results. The advantages and importance of a Trade Commissioner Service are, however, now securely established. Among the functions of a Trade Commissioner it is his duty:—

(1) To keep in close touch with the Government and State authorities in the Dominion to which he is attached.

(2) To visit the principal commercial centres in his area and establish touch with the members of the commercial community.

(3) To study and report upon the tariff laws, and customs regulations, as well as legislation affecting banking, patents and copyrights, shipping, harbours, etc.

(4) To watch the imports into the Dominion, to furnish reports on the best methods of meeting foreign competition, and to furnish reports on financial and trade conditions.

(5) To forward early information as to contracts open, or likely to be open, to tender the opening of new industries, and the extension of public works.

(6) To make an annual General Report on the conditions and prospects of trade in his area, and to supplement it by special reports or monographs dealing as exhaustively as possible with particular questions which are likely to be of interest to British firms.

THEIR DAILY DUTIES.

These functions are of a more or less general character. It remains to mention the extremely important daily duties of the Trade Commissioner. He is expected to supply to the Board of Trade a regular flow of commercial information in regard to openings for British trade in the area with which he is concerned; to supply lists of names of likely importers of British goods and of suitable agents for British producers; to maintain an active correspondence with firms in the United Kingdom who wish to extend their trade with the Dominions; to receive applications from local exporters and importers who wish to enter into business relations with the Mother Country; to advise firms as to conditions under which they should or should not spend money to develop a connection; and to call attention to the particular methods of doing business which are best adapted to the Dominion to which he is attached.

VALUE OF THE TRADE COMMISSIONERS' WORK.

It is almost superfluous to point out that much of the work of a Trade Commissioner is incapable of advertisement. It is no part of his business to blazon forth to the world at large the information collected by him and the action taken by him to promote inter-Imperial trade. Some of the best work of the Trade Commissioners has consisted in the supply of timely information and assistance which has prevented the British trader from being supplanted by his foreign competitor. Definite instances are known to the Board of Trade in which trade that has fallen into the hands of foreign competitors has been recovered for British trade as a direct consequence of efforts by the Trade Commissioner. From the very nature of these cases it would be undesirable to describe them in detail. It may, however, be mentioned that the Trade Commissioners have frequently taken up questions relating to legislation affecting tariffs, copyright, patents, and other matters, and that good and useful results have followed from the consultations which have taken place between them and the authorities concerned. An index of the value of the work of the Trade Commissioner Service is to be found in the steadily growing volume of their work, in the increasing number of

letters of appreciation received by the Board of Trade and the Trade Commissioners themselves, and in the enhanced interest taken by the commercial community in the periodical official visits paid by Trade Commissioners to this country.

OFFICIAL VISITS OF TRADE COMMISSIONERS TO THE UNITED KINGDOM.

Eight official visits to the United Kingdom have so far been paid by the Trade Commissioners. These visits were at first for only short periods, but, with the growing demands made on the Trade Commissioners while in this country, they have increased in importance, and the last visit of the Trade Commissioner in Canada extended to a period of five months. It is worthy of note that the Trade Commissioner in Australia during his 1916 visit interviewed 705 firms and deputations, and visited 31 works, while the Trade Commissioner in Canada, during his visit last year, got into personal touch with 769 firms, associations, and deputations in London and in 24 other important centres, and visited 32 works. It would be difficult to exaggerate the important part which such visits play in the development of the Empire's trade. No person with any knowledge would attempt to depreciate the resourcefulness and enterprise of the British manufacturers and merchants who lifted British trade to its pre-war level. But the experience of less than ten years' working of the Trade Commissioner Service has proved beyond all doubt that the Trade Commissioners can be of real service in improving and supplementing the British trader's knowledge of the varying conditions in the Empire's markets, the openings which occur for fresh enterprise from time to time and disappear if not accepted with promptitude, and the methods of trading most suitable for a particular area. The visits also serve a most useful purpose in bringing the Trade Commissioners and the officers of the Department at home into direct touch with one another and enabling them to obtain a first-hand knowledge of each other's work. It is proposed to make these visits a constant feature of the Empire's commercial service, and it is hoped that manufacturers and merchants will take full advantage of the visit which is shortly to be paid to this country by the Trade Commissioner in South Africa.

EXTENSION OF THE TRADE COMMISSIONER SERVICE.

The work of the Trade Commissioners has been under investigation by the Dominions Royal Commission. In their Report, issued in February, 1917, they made strong recommendations in favour of an increase in the number of Trade

Commissioners in the Dominions and of an extension of the Trade Commissioner service to other parts of the Empire. The Board of Trade had simultaneously been engaged on a scheme for the strengthening of the service, and it has now been decided to increase the number of Trade Commissioners from four to fifteen or sixteen. Under the new scheme, so far as the allocation of posts has been decided at present, it is proposed that four of the commissioners shall be stationed at important centres in Canada, the senior of them dealing also with trade in Newfoundland; two Trade Commissioners will be stationed in Australia; one in New Zealand; two in South Africa; two in India; one in the West Indies; one in the Straits Settlements, and one will be unattached to any definite station overseas but will be available in the Department for any special service.

THEIR PERSONAL QUALIFICATIONS.

The personality and qualifications of the Trade Commissioners are of course of paramount importance. The area of selection is necessarily limited at a time when the efforts of the manpower of the nation are concentrated on the successful prosecution of the war. The difficulties in the way of filling the new posts are therefore greater than they would be in normal times, but considerable progress has already been made. The Department have had the advantage in this matter of the assistance of a Selection Committee containing prominent representatives of British trade and industry. The advantages of a business training in connection with the Trade Commissioner service are so obvious that they need not be stated, and the Selection Committee are taking such training largely into account. At the same time care is being taken not to rule out candidates who possess other special experience fitting them for the work.

Of the existing Trade Commissioners, Mr. C. Hamilton Wickes, who has given invaluable service for four years in Australia and for five years in Canada, will at present remain at head-quarters in this country. It should be explained that an important feature of the new scheme is that the Department at home will always have the benefit of the direct assistance and advice of one or more Trade Commissioners with practical experience of trade conditions in the Empire. Mr. G. T. Milne, now Trade Commissioner in Australia, will take up his duties as soon as possible at Montreal as senior Trade Commissioner in Canada, in succession to Mr. Hamilton Wickes. Mr. W. G. Wickham will continue to serve as the senior Trade Commissioner in South Africa, and Mr. R. W. Dalton will remain in New Zealand.

Mr. T. M. Ainscough is proceeding almost at once to serve at Calcutta as senior Trade Commissioner in India. He was manager of a commercial firm at Shanghai for five years, and then undertook a confidential commercial mission across China and Eastern Tibet. In 1914 he undertook a special mission to China for the Board of Trade, and latterly has been Secretary to the Board of Trade Textile Committee, and the Empire Cotton Growing Committee.

Mr. S. W. B. McGregor will be appointed to the senior Trade Commissionership in Australia, and will take up his duties in Melbourne in the course of a few months. He is an engineer who has latterly devoted attention more particularly to the commercial side of the engineering, machinery, and metal trades. He has carried out work in South America and China on behalf of important groups of British manufacturers.

Mr. Wilson Goode, who was Secretary to the Importers' and Exporters' Association of Manchester, is proceeding to South Africa to serve as the Acting Trade Commissioner in that Dominion during the absence of Mr. Wickham on his official visit to this country in the spring.

Mr. F. W. Field, who is at present the Imperial Trade Correspondent at Toronto, and Editor of the *Monetary Times* is to be appointed as a Trade Commissioner in Canada, with head-quarters at Toronto.

It is hoped that it will be possible without any undue delay to announce other appointments.

APPROVAL OF IMPERIAL WAR CONFERENCE.

As a final comment on the value of the Trade Commissioner service, attention may be called to the following resolution passed unanimously on the motion of General Smuts at the Imperial War Conference in April last :—

"The Imperial War Conference welcomes the proposed increase of the Board of Trade service of Trade Commissioners and its extension throughout the British Empire in accordance with the recommendations of the Dominions Royal Commission, and recommends that the Governments concerned should co-operate so as to make that service as useful as possible to the Empire as a whole, especially for the promotion of inter-Imperial trade."

THE SILK INDUSTRY IN INDIA.

We take the following from the *Indian University and Powers* :—

The Canton variety of silk worm is a multivoltine, producing crop after crop in quick succession all round the year. It is closely related to the Mysore silk worm and produces small cocoons, but with a very good quality of silk. The cocoon is not worth exporting, except in the case of pierced cocoons, which are exported as waste silk. The price when I was in Canton averaged about 80 dollars per *picul* of 133 lbs. In regard to colour of cocoons and silk, this varies. There are some which are the same light greenish colour as the Mysore, and others which have the rich yellow of the Bengal, but the bulk are pure white, and only the last-mentioned are used for producing reeled silk for export. There are large filatures engaged in reeling this silk, which is eagerly bought up by foreign merchants. A very large proportion, however, of the cocoons are reeled and made into silk fabrics in China. There are a number of small weaveries in Canton working with Chinese hand-loom of a very ancient pattern. The work turned out is, however, excellent.

It was noteworthy that a great deal of the raw silk is put on the looms without being bleached, the fabrics being bleached afterwards. On the other hand, a good deal of the raw silk is bleached before being put on the looms. On some of these old-fashioned looms patterns of beautiful design are worked by means of a very ingenious "Jacquard" arrangement, if so it may be called, a weaver sitting above the loom and pulling an intricate number of threads to work the healds. No arrangement appears to have been made in Canton for introducing the much more simple Jacquard attachments, although the present plan certainly produces very satisfactory results. The silk expert, who kindly assisted me in my enquiries and who had had eight years' experience in the country, told me that he did not know of any school in South China for the instruction of the Chinese in superior methods of either rearing worms, reeling silk, or weaving; but the industry is so extremely ancient and the Cantonese are so very painstaking and careful in attending to details, that the whole industry is carried on with great success both as a cottage industry and otherwise. Recently, however, large filatures have been organized on the European model, and these appear to be very prosperous.

In North China we visited Shanghai, Peking and Mukden, and made enquiries at various centres,

Here we found three excellent varieties of cocoons, namely—Wusih, Shewshing and Hupeh. Experts whom we consulted told us that, in their opinion, the Wusih and Shewshing, which are white cocoons, are superior in quality to the Italian. The extreme care and attention which is given by the Chinese to the cultivation of their silkworms, and the long period that the industry has existed will account for its great success. Government is now taking considerable trouble to establish silk schools in different parts of the country, so that improved methods may be introduced.

I was able to get a supply of Wusih and Shewshing eggs forwarded to me, and have hibernated them in Simla and am sending them out to various centres throughout India, as well as to all Government institutions with which I am acquainted. This we are doing free of charge, although the experiment has cost us a good deal, as I am satisfied that one, if not both of these varieties, may be of extreme value to us in India and may be better suited to the climate than either the French or Italian varieties. I have asked the different centres to which the eggs are being sent to kindly report the result. The cocoon harvest is in June and July in the hot weather, and hence it is probable that this kind of silkworm would be well suited to India.

The North-China silkworms are univoltine, and the cocoons, as in the case of other univoltines, are far superior to the multivoltines of South China. I may here remark that the univoltine variety has one great advantage over the multivoltine, inasmuch as its care does not interfere with the growing of the ordinary crops. It is usually produced at a time when agricultural labour is, comparatively speaking, free, and helps to supplement the revenue from other crops without interfering with them. In making investigations on this question in France and Italy, experts there said to me that they did not care to introduce multivoltine varieties into Europe because it was found that they interfered with other and more profitable crops, which was not the case with the univoltine. This is a point which should be borne in mind. The agriculturist naturally looks for profit, and the introduction of a crop which pays better than silk has been known in some localities to lead to a wholesale destruction of mulberry trees, as was the case some years ago in parts of Italy.

"There is an immense demand for the above three kinds of cocoons in the Chinese filatures and high rates prevail so that the cultivation is extremely profitable to the people. The Yang-tse-Kiang river forms a splendid highway for their

transportation to the filatures on the coast, and this, in the absence of railways, helps in the production. Both the Shewshing and Wusih are pure white cocoons, while the Hupehs are a rich golden yellow. The Hupehs appear only to have been recently introduced to the filatures, and were at first looked upon as inferior. In fact, reelers in some of the filatures refused to use them, showing how strong is the feeling in China in favour of white cocoons as opposed to yellow. It was necessary in some of the filatures to begin with two or three basins and gradually work up others. The Wusihs are produced in a flat-level country, very like Bengal or the Gangetic valleys, the summer heat being very great. The Shewshings are produced in a somewhat hilly country at an elevation of about one thousand feet. The Hupehs come from the interior of China.

The mulberry is mostly planted in the form of dwarf trees, two or three feet high, planted very close. Lately, bushes have been introduced, but as a rule only one or two stems were allowed to grow, and these were cut down yearly. The leaves are stripped off and fed separately, and the worms are reared on large round trays. The custom for cocoonage, *viz.*, for the mounting of the silkworms to produce cocoons, is to place bundles of grass, tied at the bottom with their heads spread out. Women gather the worms in baskets when they appear to be ripe and go round placing them on the top of the bundles of grass to spin. The method is somewhat primitive, but answers its purpose.

Another plan is to have a long straight rope with flat stars inserted at intervals on which the worms are cast to spin. They are not encouraged to "mount" of their own accord. The Chamber of Commerce and the French Consulate in Shanghai are endeavouring to introduce improved methods amongst the rearers. The filatures are quite up-to-date, and the basins which we saw had five, six, and even eight buttons working. Women are mostly employed in doing the reeling, men supervise and watch the work. It is not found necessary to re-reel, as the reeling itself is extremely good. In a filature which we were told that all the raw silk they produced was marked as 100 tavel, that is, without any breaks, while the variation in denier was merely fractional. At the time of my visit this raw silk was fetching 7 American dollars per pound (not kilo), equivalent to Rs. 21 per pound.

Where large numbers of buttons are worked, the cocoons are prepared for the reelers by girls, and the breaks are mended by separate women who are employed for the purpose. It is a little remarkable that they are paid by the day and not by results. If, however, they do not produce a fair day's work, they

are fined. Owing to the high price of raw silk and the strong demand for it, the number of filatures has enormously increased of late. The go-downs for storing cocoons which we visited were nothing like so up-to-date as those which we visited in Srinagar. They are a good deal troubled with rats in the go-downs, but rely on cats and traps for keeping these down—they are not able to use poison. The raw silk was packed with extreme care and not in the apparently rough and ready manner which prevails in Kashmir.

We visited a very interesting weavery in Pekin which was much more up-to-date than those of Canton. They had imported Jacquard attachments for their hand-loom from Japan, and these were being very successfully worked, many excellent fabrics being produced. Everywhere, both in South and North China, one could not help being impressed with the fact that the enormous production of cocoons in the country facilitated the manufacture of cheap silk fabrics, and that in this respect India could not hope to compete with either China or Japan till she had established a sufficient production of cocoons. The success of the industry was based on the existence of the raw material.

Fruit Growing in India.

The report on the progress of agriculture in India for the year 1916-17 has the following:—

As a large proportion of the people of this country are vegetarians there is naturally a great demand for good varieties of fruit if they are available. As noted in last year's report, considerable attention is being paid in most provinces to the study of fruit trees, and varietal and cultural experiments have been in progress for some years. When the Imperial Economic Botanists started work at the Quetta Fruit Experiment Station, they realized that the problem of packing fruit for transit was the limiting factor in the extension of the area under fruit. They have now succeeded in solving this problem. The Indian dealers have now realised the value of transporting the grapes, peaches, etc., in the improved boxes devised by the Howards, and there was a large sale of these boxes during the year under report. The principal Railway Companies have also helped by laying down rules that consignments of fruit should be grouped for purposes of charge and that returnable packages approved by the North-Western Railway should be returned free of charge to Quetta, Gulistan or Chaman. As the valleys of Baluchistan are eminently suitable for fruit cultivation, and as the market for the produce is assured, these concessions on the part of railways will help materially in the improvement of the industry and lead to an extension of the area under fruit. The demand for

nursery stock is now very great. During the last few years the Howards have been working out the best methods of propagation under Quetta conditions. In 1911 they took up the study of stocks and soon found that stocks like the Black Damask and the Muzzard which are used on the damp soils of Great Britain and the north of France were quite unsuitable for the hot, dry soils of Baluchistan. On the other hand, such stocks as the Mariana, Myrobolan, Mahaleb and Juan de Metz imported from New Orleans have done exceedingly well. The cost of import comes to about an anna for each established plant. Among the local stocks almond is the only one found which is likely to be of much use. As regards management of nurseries, the problems of soil aeration and soil temperature have been solved by the adoption of furrow irrigation and mulching of the soil in May with a deep covering of *Sophora Alopecurioides*. As the results obtained in the propagation of fruit trees at Quetta are likely to be of more than local interest in India, a bulletin has been prepared on the subject. It is quite feasible to import suitable stocks in bulk and to bud them locally and thus make fruit culture more paying in Kumaon Kulu and Kashmir.

Considerable studies on mangoes, oranges, guavas and figs have been in progress for some years past in Bombay and good results are being obtained in several directions. The proper pruning of guavas and oranges in particular has brought about marked improvement.

In the Central Provinces the Economic Botanist has been carrying on investigations regarding economy in use of irrigation water for oranges and bananas. Though the orange trees received only nine waterings during three years they began to bear fruit when 2½ years old. In the case of plantains Dr. Graham has introduced a special method of watering which is described in the *Agricultural Journal of India*, July, 1917. By this method it has been found possible to fruit all the best Bombay varieties. The one precaution necessary is to remove the sucker until the tree flowered.

In the North-West Frontier Province imported peaches, plums and apricots have displaced the local varieties in public favour. The new varieties have brought about an extension of the fruit season, stocks to suit the new varieties have been found, and Mr. Robertson Brown distributed free nearly 30,000 budded trees of high quality among the fruit-growers of the province. Economical methods have been demonstrated in the control of certain insect pests and diseases that affect the peach and pomegranate. Several of the Mediterranean olives that were planted in 1912 yielded over 15lb. of fruits, each a crop which is considered quite phenomenal in Italy for a tree four years old. Though the Mediterranean olives have fruited early and generously in the Peshawar valley, unfortunately the destructive olive fruit fly has been discovered in wild olives that were gathered from the surrounding hills. This is a danger that will have to be reckoned with. It is expected that carob and olive will eventually become common trees in the land of the Pathans. It may, therefore, be confidently said that the rapid improvement and expansion of the fruit trade in the North-West Frontier Province are assured.

Both the Arabian date-palms and the olives imported from Marseilles are doing well in the Punjab

ECONOMIC NOTES.

Mineral Oil from Home Sources.

The following statement was issued recently by the Ministry of Munitions regarding the policy of the Department on the production of oil from home sources.

Certain communications have recently been made to the Press upon the subject of the production of mineral oil from home sources. These communications are apparently based on incomplete information, and therefore may have created a mistaken impression. Apart from very serious technical difficulties which have to be overcome, the competing claims of other urgent war services for labour and materials render impossible the rapid development of methods which might otherwise be pursued with advantage. The Ministry of Munitions, however, has been steadily pursuing the policy which is considered to be best designed to produce substantial results in the shortest time. It is obviously undesirable to explain the actual methods or to state the quantities of oil which it is estimated will be produced, but it is thought that some indication may be given of the general policy which is being followed.

All existing plants at the shale works of Scotland and the gas works and coke ovens throughout the country are being pressed to their full capacity and are being extended so far as present circumstances permit. It has been found by experiments that certain plants already in existence can be adapted in a short time to treat new material by new methods. This adaptation of plants is being actively pursued, and has the obvious advantage of saving labour time, and material and making the best use of the existing staff and equipment. On the other hand, where suitable raw material cannot be dealt with on existing plants, arrangements are in progress for erecting works for the extraction of oil. Some of the correspondents suggest that a very large output of fuel oil can be obtained because one unit can produce or has produced a given quantity of oil. In the present state of supply of labour and materials any such easy multiplication is liable to be entirely fallacious.

Sir L. Worthington Evans, M.P. (Parliamentary Secretary to the Ministry of Munitions), in a statement on the subject said that the Government had not been neglectful in the production of oil in this country. A good deal of shale oil has been produced in Scotland, but the attempts to produce it in various parts of England have not been so successful. Oil can be produced in larger quantities,

however, from coal, especially cannel by low temperature carbonization. Low temperature retorts have not, up to the present, been worked commercially, but development in this direction is hoped for. The difficulty of getting labour is now limiting the number of retorts that it is proposed to erect. Three collieries, however, have been selected where retorts will be put up on the Scottish system of dealing with shale, although they are not likely to be in operation for some months. Fortunately the Ministry of Munitions has found means for getting more immediate results by utilizing the existing vertical retorts at gas works. There is an enormous advantage in dealing with coal at gas works because of the experience that has been gained there in retorting, labour-saving devices, and facilities for dealing with the raw material and the products.

Further progress has been made in another direction, by which oil can be produced in satisfactory quantities from materials which up to now have been regarded practically as waste; in fact, it is expected that munition factories will be using this home oil within the next few months. Experiments have been made in boring by private companies, but not by the Government, although plant is being prepared for that purpose.

Agriculture.

In the course of an interesting article on the application of Electricity to crops, the *Near East* says:—

ELECTRIFICATION OF CROPS.

In last week's notes we referred to the progress that has been made in the utilisation of electricity in agriculture, and mentioned the economic and technical advantages that are obtained by its employment as a motive power for driving agriculture machinery for ploughing, threshing, etc. The most remarkable results, however, of the utilisation of electricity in agriculture are those obtained by its application to crops. Electricity has a very beneficial effect on all plants, and it has been proved that by its use an increased yield of from 30 to 50 per cent in wheat growing and other cereals can be obtained on land of average fertility. How this electrical influence operates has not yet been defined exactly, but as it has been proved that plants to which electricity has been applied grow far heavier and far more productive than has otherwise been the case, we can safely surmise that under the electric treatment the circulation of the plant juice is hastened, and plants are, therefore, able to "feed" more easily. A similar effect is observed in the human subject when under electrical stimulus. In Italy and France, and especially in Switzerland, the electrification of crops or "electro culture," as it is termed, has been practised for some five or six years now. In this country experiments carried out under the supervision of the Board of Agriculture show that in oats electrification has resulted in an increase of 49 per cent in grain and 88 per cent in straw.

In other cereals, such as wheat, the increased yield has been 30 to 60 per cent and even higher. The importance of this may be better realised when it is borne in mind that of the 35 million quarters of wheat which are annually consumed in this country about twenty millions have to be imported.

ELECTROCULTURE INSTALLATIONS.

The installation system for the electrification of crops adopted in this country, mostly in the Midlands, is undoubtedly superior to those used on the Continent. This British installation is of a most simple and yet most reliable design. The method employed is to stretch a network of extremely fine wires over the field to be treated, barely visible, twelve yards apart, and suspended eighteen feet above the ground from larch poles. A positive continuous current of electricity is supplied to the wires at the extremely high pressure of 60,000 to 100,000 volts, but the quantity of current used is as small as 10 to 30 watts per acre, so that the cost is rather trifling. The necessary dynamo can be driven by a farm oil engine of 2 h.p. Thus, the electrification of crops can be applied anywhere, even in remote districts, and the electrical apparatus is so very simple to control that it is claimed that it can be operated by unskilled labour without difficulty. It is asserted that by the use of this system of electrification the average yield per acre in this country can be increased from the present figure of thirty bushels to fifty or sixty bushels; so that the country's dependence upon imported supplies could be reduced by 30 per cent.

EFFECT IN GARDENS.

Better results seem to be obtained when electricity is used in gardening, and for those who would like to try electrification of plants in that direction, and either cannot obtain locally an electric supply, or do not wish to go to the expense of purchasing an electrical plant (of oil engine, dynamo, etc.), as described above, before being assured of the success by experiments, an economic method of experimenting may be mentioned. It is, of course, for experiments conducted on quite a small scale in a garden frame, or in the open garden. A small electric accumulator, such as is used for ignition in motor engines, will supply the battery power; an induction coil intended for more or less continuous running can be bought from almost any scientific instrument maker. When the coil is working one end of its secondary winding, giving chiefly a positive electrical discharge, is applied to a piece of galvanised wire net supported a few feet above the ground: the other end of the winding is attached to a zinc plate buried in the ground. Short thin wires are suspended at frequent spots in the netting, pointing towards the ground, and act as conductors from which the electricity can creep through the air to the tiny hairs or conductors on the leaves of the plants. Of course, some technical skill is required. The serious gardener must, however, have the right type of apparatus, and must take special precautions as to the hours during which the current is applied, and the weather. Electricity is of no use during very hot, dry, sunny weather, nor in heavy rain. It is usually applied early in the morning and in the evening, and certain plants, for example, cabbage—require more watering. The plants themselves must never touch the overhead wires, otherwise the current will be conducted by them directly to the earth. The wires must be isolated by porcelain insulators.

MYSORE ECONOMIC CONFERENCE. AGRICULTURAL COMMITTEE.

Brief Report for the months of March and April 1918.

Medicinal herbs.—The Committee have taken steps to import seeds and bulbs of medicinal herbs for experimental cultivation on the Hebbal Farm with the co-operation of the Director of Agriculture.

2. *Takavi loans for purchase of manure and seed for sugar-cane cultivation:*—The maximum amount of loan now ordinarily grantable under the Land Improvement Rules for the purchase of seed and manure for sugar-cane and the time allowed for repayment were considered inadequate, and Government have been requested to raise the amount to Rs. 500 and extend the period to eighteen months.

3. *Facilities for conversion of dry into wet land:*—The existing rules regarding applications for water are being examined with a view to secure simplicity of procedure and quick disposal.

4. *Taluk Agricultural Associations.*—The function of these Associations in the Agricultural Organization of the State was considered and it was thought necessary that they should work in close co-operation with the Village and Taluk Progress Committees on the one hand and the Agricultural Department on the other. Under the scheme worked out by the Committee these Associations would be affiliated to the District Committees of the Economic Conference and constitute an efficient executive both of them and of the respective Taluk Progress Committees.

5. *Concessions to Agricultural Supply Societies.*—The Department of Agriculture have been requested to extend the following concessions to Co-operative Societies organized for agricultural supplies:—

- i. Utilisation of the services of such societies for distributing manure.
- ii. Grant of two years' credit as regards repayment. And
- iii. Exemption from interest for the first year.

6. *Agricultural Education.*—The Committee have supported the Director's proposal to extend the Vernacular course at Hebbal to two years and to combine general instruction with agricultural training.

7. *Extension of Agriculture.*—The Irrigation Department have been requested to survey perennial and other *hallas* with a view to tracing hitherto neglected potentialities of irrigation.

The Committee are of opinion that better use should be made of *gomal* lands which are now in a state of nature and that special duties should be laid on the village communities for performing specific agricultural operations at stated periods of the year.

The Committee have generally accepted the suggestions contained in Dr. Coleman's valuable note on the possibilities of agricultural improvement during the next ten years, and framed propositions on the more important among them, for discussion at the next Conference.

8. *Live-stock*.—The Committee have submitted proposals for granting subventions to owners of breeding bulls, buffaloes and stallions on the lines of the Madras Rules on the subject.

Thirty Dumba sheep were imported from Karachi in pursuance of the scheme submitted to Government, and since sanctioned, and in the course of acclimatisation, a few were lost. One of the Merino rams imported from Australia suddenly sickened and died. These losses are probably to be expected in experiments with unknown factors, but are none the less matter for regret. The rest have been left on the Hebbal Farm and will shortly be removed to Pillaganahalli, as soon as the enclosures and necessary sheds have been put up.

9. *Training of Malis*.—To meet the demand for trained gardeners throughout the State, a school for malis providing a year's training in practical work has been worked out in co-operation with the Gardens Department and submitted to Government for sanction. The cost, including stipends, will be Rs. 2,600.

10. *Miscellaneous*.—Proposition meant to be urged before the next Conference were considered and a draft programme of work for 1918-19 was prepared. The executive staff contributed articles based on their special knowledge of local conditions to the *Arthasadhaka Pathrika*. The Committee have continued their close co-operation with the Agricultural and Sericultural Departments.

N. RAMA RAO,
Secretary.

EDUCATION COMMITTEE.

Brief Report of work done during April 1918.

1. *Business Education*.—Outlines for a book on Methods and Machinery of business and standard habits have been drawn up and the subject is being considered by the Committee.

11. *Scheme for improving Language study*.—The Chairman's scheme of scholarships for Language study was revised in the light of the suggestions received from the members and then sent to the Inspector-General of Education and the University Council for their opinion.

III. *Scheme for increasing the supply of Teachers by making "Teaching" a subject of study in all stages*.—A scheme for making "Teaching" a subject of study in all Secondary Schools and Colleges was considered along with Dr. Sadler's views on the point, and a recommendation was made to Government for introducing "Teaching" into the University Courses and Examinations.

IV. *Industrial Education for women*.—Mrs. K. D. Rukminiamma's scheme of Industrial and Practical Education of women has been referred to the Committees for the management of the Cottage and Home Industries Institutes of Bangalore and Mysore for favour of opinion.

V. *Higher courses of Industrial Education*.—A scheme for training persons in secondary courses in Tailoring, Bamboo work and Leather work and for training teachers for Primary Industrial Schools in these subjects was tentatively approved and steps have been taken to start experimental classes, under the management of the Home Industries Institute Committee, Bangalore.

VI. *Scheme for granting advances to Home-Workers*.—A set of rules was drawn up for the supply of raw materials to Home-workers and were approved by the Committee and submitted to Government for sanction.

VII. *Indian Physical Education*.—Mr. Humza Hussain's note on the Indian Gymnasia was approved. A recommendation was submitted to Government to the effect that one Thalimkhana be opened at Mysore as an experimental measure.

VIII. *Boys' Scout Movement*.—Mr. F. C. Irwin of Canada was appointed Scouts Organiser, as recommended by the Committee. He has started work under the direction of the Inspector-General of Education.

IX. *Educational Survey*.—Arrangements having been made for Educational Survey work in respect of limited areas under the direction of Mr. C. Krishna Rau, the Inspector-General of Education has been requested to permit the teachers of Primary Schools to comply with the requisitions made from this office in this connection.

X. *Education of Depressed Classes*.—Inasmuch as a large portion of the sum of Rs. 15,000 provided in the current year for scholarships for the Depressed Classes was likely to remain unutilized in ordinary course, a recommendation was made to Government that permission may be kindly accorded for utilising the available amount for providing the pupils of the Depressed Classes with clothing and with books, slates and other educational requisites.

XI. *Children's Magazine*.—Arrangements are being made for publishing a Children's Magazine, under private agency, on the lines on which similar Magazines are published in Bengal and other parts of India.

XII. *Popular Science Lectures*.—Seventeen lectures were delivered by the Kannada Popular Science Association, as following:—

AT BANGALORE

1. The uses we derive from plants.
2. Ancient history of plants.
3. The Steam Engines.
4. The Volcanoes.
5. Light (1st part).
6. Rain.
7. The Dwelling House (2nd part).

AT MYSORE

1. Chapters in plant life.
2. Plants and their surroundings.
3. The Dwelling House.
4. Travelling Facilities.
5. The Steam Engines.
6. Diamonds.
7. Volcanoes.
8. Light (1st part).
9. Rain.
10. The Dwelling House (2nd part).

XIII. *Public Libraries*.—The details for improvement furnished by the Public Libraries of

Bangalore and Mysore for the sum of Rs. 15,000 allotted for their development were approved with slight modifications.

Action has been taken with a view to securing the whole of the Seshadri Memorial buildings for the use of the Bangalore Public Library.

XIV. *Public Lectures*.—With a view to improving the efficiency of the lecturers, a scheme of revised salaries to Itinerant Lecturers was also considered. A recommendation was submitted to Government that salaries of the lecturers may be raised and that if the present lecturers be not found deserving of the enhanced pay and allowances, they should be removed and more efficient men appointed in their stead.

XV. *Work done by the Cottage and Home Industries Institutes and Classes*.—Rao Bahadur Rajakaryaprasakta M. Shama Rao, Esq., M.A., has kindly accepted the office of Chairman of the Home Industries Institute Committee, Bangalore.

Reports of work done by the Cottage and Home Industries Institutes and Classes of Bangalore and Mysore and in other places (as far as information has been received) are printed as Appendices.

XVI. *The Backward Classes Scholarships*.—The annual report of the Sub-Committee was drawn up and the records were transferred to the Education Department in pursuance of the Government orders.

XVIII. The Annual report of the Committee was drafted and considered.

The subject of making an enquiry into the state of Secondary Education in the Province was considered and it was held that there was no need at present for such an enquiry and the matter was intimated to Government

J. S. CHAKRAVARTI,
Chairman.

Brief statement of work done during the month of March 1918, by the Cottage and Home Industries Institutes, Bangalore and Mysore.

No.	Department under control	Details of main head	Value of Work done	Value of article sold	Remarks
BANGALORE					
1	Affiliated Classes ...	26 Classes	351 13 8	236 3 3	Applications for 18 fresh classes in Basavangudi, Sheshadripuram, Gavipuram extension, and Patnoolpete, are under consideration of the Committee.
2	Demonstration Classes...	(1) Machine knitting	1 4 0		
		(2) Brush making			
		(3) Hemstitching			
		(4) Embroidery			
		(5) Match industry			
		(6) Rope making	6 0 0		
		(7) Hammock making	0 8 0	0 8 0	
		(8) Bamboo chicks making			
		(9) Tape making			
		(10) Horn articles making			
		(11) Vermcelle			
		(12) Umbrella handle making			
3	Home Workers ...	66 Home workers were registered			
4	Sale Room ...		...	148 8 1	
MYSORE					
1	Affiliated Classes ...	24 Classes	...	218 7 6	
2	Demonstration Classes...	Bamboo Work	2 3 0	9 13 0	
		Knitting	0 9 8	1 5 8	

Monthly Return of the Home Industries Classes under the management of District Committee for the month of March, 1918.

1. Serial No.	Organisation 2		Working and Attendance 3			Teacher and Teaching 4		Supervision 5	Accounts and Stock 6				7. Remarks			
	Name of Village and Taluk	Subject taught	When started	Whether grant-in-aid or worked by City or District Committee	Ordinary working hours	Number of days in the month on which the class worked	Number on the rolls on last day of the month	Average attendance during month	Name, age, sex, pay and qualification of teacher	Whether prescribed syllabus is followed?	When last inspected and by whom?	Opening balance	Receipts	Disbursements	Closing Balance	Book value of furniture, implements and stock in hand
1	Talkad, T. Narasipur Taluk	Metal work	1-4-17	Grant-in-aid	11 to 5 p. m.	17	20	17	Mysore M. Srikantaiya ...	Yes	S. D. O. Nanjangud 12-2-18	...	...	21	...	...
2	Sindhughatta, K. Pete Taluk	Weaving	10-1-17	Do	7 to 11 a. m. 2 to 6 p. m.	24	16	7	K. Chennaiya Setti	Yes	Asst. Insp. of Education	...	...	20	...	...
3	Melkote	Embroidery	19-6-17	Do	7 to 9 a. m. 1 to 3 p. m.	25	16	1	Rangaswami Iyengar	Yes	Do on 2-11-17	...	...	...	...	...
4	Mandya	Weaving	1-9-17	Do	11 to 5 p. m. +	10	24	10	D. Virappa	*		...	...	...	...	...
5	Masam Nayana-halli	Soap stone	11-6-17	Do												
6	Surgur, Heggedevanakota Tk.	Bangle making	15-12-17	+												
7	Nanjangud	Rattan														
8	do	Carpentry														
1	Closepet Kasaba	Silk twisting and throwing	1-2-18	Do	7 to 11 3 to 5	25	24	20	Bangalore Hanumanthaiya...	...	Supervisor 29-3-18	...	...	...	...	4 twisting charakas 300 pan-thies

* School closed on account of poor progress done.

† School temporarily closed.

‡ Particulars will follow.

INDUSTRIES AND COMMERCE COMMITTEE.

Brief report of work done during the month of February, 1918.

1. *Supply of Graphite* :—On the suggestion of the Special Forest Officer and the Chief Electrical Engineer, the Committee resolved that in view of the immediate requirements of Mysore of about 100 tons of graphite annually, Government be requested to direct that the necessary steps be taken to enter into early negotiations with the Travancore Durbar or a syndicate in Hyderabad to ensure the requisite supply at a reasonable cost.

2. *Modern Hindu Hotel, Kadur* :—At the instance of the Deputy Commissioner and President, Kadur District Committee, the Committee have recommended to Government, the grant to Mr. Venkatramaniah Setty, to enable him to open a Modern Hindu Hotel at Kadur, of a loan of Rs. 500 at 6½ per cent per annum for the purchase of vessels, etc., on proper security and of a subsidy, for a year, not exceeding Rs. 150 to meet the actual loss, if any, incurred by him during this period, on examination of the accounts at the end of the year.

3. *Free Supply of Wattay* :—On a reference from the Secretary, Economic Conference, and on the recommendation of the President, Kadur District Committee, the Committee have recommended to Government, the issue by the Forest Department, of free licenses for the supply of *Wattay* to *bona fide* basket makers in the Malnad for a year, subject to further consideration at the end of the period, on the results achieved and the desirability of continuing the concession.

4. *Takkavi Loans*.—(a) On the recommendation of the Director of Industries and Commerce, the Committee have recommended to Government the grant of a loan of Rs. 6,000 to Mr. Brahmappa Thavanappanavar of Davangere to enable him to purchase a self contained Rice Mill under the Hire Purchase system

(b) The following loans were sanctioned by the Chairman during the month :—

1. Loan of Rs. 2,600 to Messrs. Karappanna and Subba Rao of Asagodu Village, Jagalur Taluk, for the purchase of two double roller gins for ginning cotton.

2. Loan of Rs. 2,800 to Mr. M. Thebbanna of Mysore for the purchase of two Rotary Mills and a Motor of 15 H. P.

5. *Itinerant Smith-Carpenters*.—Read correspondence ending with letter No. 4909, dated 15th

February, 1918, from the Secretary, Economic Conference, about the appointment of Smith-Carpenters by the Agricultural Committee.

In his Note, the Secretary, Agricultural Committee, states that need has arisen for providing means to teach the ryots to fit parts together and to attend to simple repairs in connection with the improved Agricultural implements sold to them and that therefore it is proposed to attach to each District, an Itinerant Smith-Carpenter who will go about from place to place and repair *gratis* appliances sold by the Agricultural Department.

The Committee, after discussing the subject in detail, were of opinion that in view to the establishment of District Workshops, the Central and District Workshops should have spare parts of improved implements and machinery sold to the people by the Agricultural and Industries Departments, and that arrangements should be made to collect at some convenient centre implements requiring repairs and that capable artisans should be sent to repair machinery and implements at the cost of the owners, on receipt of information direct from the Amildar and that the scheme of employing a smith-carpenter for each District was not likely to work satisfactorily.

6. *Utilisation of Bones*.—Read letter No. 4506, dated the 25th January, 1918, from the Secretary, Economic Conference, forwarding for the consideration of the Committee and definite recommendations, the report of the Select Committee on Manure supply. The Select Committee consider that the question of establishing a Bone-Crushing plant should be taken up immediately.

The Director of Industries and Commerce, in his letter, dated 19th February, 1918, states that Mr. Ramachandra Rao Scindia, has put up the necessary building in Bangalore for starting a Bone-Crushing Mill. The Rail-borne Traffic Report shows only a small export of bones from the State. The Committee are of opinion that no Departmental action is at present necessary as private enterprise is forthcoming to start a Bone-Crushing Mill in Bangalore.

7. *Mineral Industries* :—The Sub-Committee on Mineral Industries recommend the grant, to the Department, of Rs. 2,000 for opening up the Corundum-bearing areas round about Arsikere, of Rs. 1,000 for opening up deposits of Asbestos near Bangalore and Hole-Narasipur, and of Rs. 2,000 for prospecting and experimenting the required raw materials for the manufacture of glass and coloured block glass for the benefit of the bangle-makers in the State.

The Committee after full discussion, resolved to request the Sub-Committee to make an exhaustive

list of important minerals urgently required for ensuring the industrial development of the State in the near future, such as chrome, bauxite, graphite, manganese, lime-stone, kaolins, etc., in consultation with the Heads of Departments, such as the Director of Industries and Commerce, the Director of Agriculture, the Chief Electrical Engineer, the Special Forest Officer, etc., and an estimate of the amount required for carrying on the preliminary investigation work in regard only to such minerals.

8. *Extension of Apprentice Course.*—On the recommendation of the Director of Industries and Commerce, the Committee were agreeable to the extension by another year, of the term of training of T. L. Seetharama Rao, Mysore apprentice, undergoing training in the Cotton Mills of the Hon'able Manmohandas Ramji, Bombay, on a scholarship of Rs. 50 per mensem.

9. *Regulating the price of Kerosine Oil.*—Read letter No. 8498, dated the 22nd February, 1918, from the Secretary to Government, Departments of Education and Agriculture, forwarding for the opinion of the Committee, letter dated the 12th February, 1918, from the Deputy Director of Commerce, about the profiteering tendency on the part of the Sub-Agents of the Kerosine Oil Companies.

Mr. C. Ranganatha Rao Sahib said that the three leading Companies at Madras who sent Kerosine Oil to the Mysore State, for sale, fixed certain prices, but owing to shortage in supply, there was keen competition for oil and the Sub-Agents sold it actually at far higher prices than those at which they were authorised to sell. The consequence was that the lowest quality of oil used largely by the middle and the poorer classes cost the people a great deal more than the prices actually fixed by the Company.

The representatives of the Company at Madras sympathised with the situation and were willing to co-operate with the Government and the Chamber of Commerce in their efforts to regulate prices provided the Companies' Sub-Agents were not interfered with in any way. The Chamber of Commerce were willing to notify the wholesale and retail prices in various parts of the State from time to time, to issue licenses to dealers who would abide by the prices fixed, and to cancel the licenses in case higher prices were fixed. All the present dealers who got their supply from the Sub-Agents would, as a matter of course, be given licenses which, however, would be liable to cancellation, if they did not strictly abide by the terms.

The Sub-Agents would be authorised by the Company to sell oil only to the licensed dealers.

The Committee resolved that it is necessary that Government should take power under the Defence of India Act to regulate the prices of fuel and kerosine oil in the State, and the Deputy Director of Commerce and the Mysore Chamber of Commerce be empowered to give a fair trial to the scheme of regulating the prices of kerosine oil within the Mysore State by a system of licenses to dealers, with the co-operation of the representatives of the Companies at Madras.

10. *Joint-stock Company.*—In his letter No. 520-25, dated the 1st March, 1918, the Registrar of Joint-stock Companies states that during the month of February, 1918, a Joint-stock Company was formed on an authorised capital of Rs. 30,000 for Banking and Trading in the Hiriur Town, Chitaldrug District.

11. *Distribution of Awards.*—The awards made by the Judges for the Exhibition of 1917 have been sent to all Districts except Mysore and Kadur from which further communications on the subject are awaited.

K. SUBBA RAO,
Secretary.

PROGRESS IN THE DISTRICTS.

Shimoga.

AGRICULTURE.

Training of Fieldmen.—In connection with the selection of students for being trained as fieldmen the Committee resolved that each Taluk Agricultural Association in the District be requested to select a suitable candidate for training as a fieldman in the Hebbal Farm and subsequent employment by the respective Taluk Agricultural Associations to popularise the use of improved appliances and the adoption of improved methods of Agriculture.

Fruit Culture.—The Committee resolved to sanction the sum of Rs. 250 recommended by the District Economic Superintendent, as a loan to Chennabasappa for fruit culture.

EDUCATION.

Opening of Schools.—Two night schools were opened in the Shimoga Taluk and one in the Tirthahalli Taluk.

INDUSTRIES AND COMMERCE.

Practical Instruction Classes.—A practical instruction class in shoe-making for Madigars and a Home Industries class in mat-weaving for other classes of people were started at Benkipur. A tailoring class was newly opened at Nonabur village.

Purchase of Sewing Machines.—The Committee resolved to purchase two sewing machines at a cost of Rs. 90 each, for the use of two Home Industries

classes, one at Kalurkatte and the other at Tirthahalli.

GENERAL.

Increase of Grant.—Considering the high price of paper and printing materials prevailing at present, it was resolved that a recommendation be made to the Central (Education) Committee for the sanction of a grant-in-aid of Rs. 300 per year to the *Shimoga Vrittanta* for a further period of three years.

The District Museum.—The District Committee was of opinion that the District Museum be established in the Shimoga Town Hall as a temporary measure provided that the Shimoga Municipal Board permit the use of the Town Hall for this purpose. It was further resolved that the Town Municipality be requested to contribute a sum of Rs. 100 annually towards the maintenance and a development of the District Museum.

Chitaldrug.

AGRICULTURE.

Improved Ploughs.—Thirty-five ploughs and forty-one plough-shares and plough-bodies were introduced by the Agricultural Department and the District Committee.

Sugar-cane Mills.—Five sugar-cane mills were supplied to four ryots in the Chitaldrug Taluk and one in the Jagalur Taluk.

EDUCATION.

Opening of New Schools, etc.—Twenty Boys' Schools, nineteen Night Schools, two Hindustani Schools, one practical instruction class, one English School, sixty-three Reading Rooms and four libraries were newly opened during the months of February and March.

Collection of Funds.—A sum of Rs. 1,940 was collected for educational purposes and a further sum of Rs. 5,360 has been promised.

INDUSTRIES AND COMMERCE.

Fly-shuttle Looms.—Forty fly-shuttle looms were distributed among the weaver of Hosadurga, Mathod, and Bagur.

Tappets.—Forty tappets were got from the Technical Institute at Bangalore and sold; forty more were made locally and sold at a cheaper rate.

Bleaching and Dyeing.—Steps have been taken to arrange for the training of a candidate of this District at Bombay in bleaching and dyeing yarn in view of the starting of cotton and wollen mills. Arrangements were made to enable three persons of the weaver community of Hosadurga to go to Dommasamudra in the Anekal Taluk for learning the art of dyeing, etc.

A Weaving Institute.—The District Committee resolved to establish a weaving institute at Hosadurga for improving weaving.

A Sugar-cane Mill.—A Sugar-cane mill was purchased by Mr. Bade Sab for the use of the sugar-cane growers in the Jagalur Taluk.

GENERAL.

Collection of Funds.—A sum of Rs. 71-10-0 was collected for the District and Taluk Progress Committees and Rs. 3,457 towards the Village Common Fund.

Conferences and Shows.—The District Conference and an Agricultural, Educational and Industrial Exhibition were held in March, 1918. Along with the general conference Agricultural, Educational and Co-operative Conferences were also held under the Presidency of Dr. Coleman, Mr. C. R. Reddy, and Mr. Ranga Rao, respectively.

CONFERENCES AND MEETINGS.

Shimoga.

The second Shimoga District Conference was held in the Sri Chamarajandra Memorial Hall, Shimoga, on the 3rd March, with Mr. M. A. Narayana Iyenger, B.A., B.L., Deputy Commissioner, in the chair. There were more than 500 delegates and visitors present on the occasion. The President explained to the audience the significance and importance of District Conference and said that the Shimoga District was one of great possibilities and had before it a brilliant future. Then followed the reading of the report of the District Economic Committee and of the schemes under Village Improvement, Minor Tank Restoration, Tank Panchayat, Village Courts and Village Forests, etc. The taluk lists of major and minor wants drawn up at the respective Taluk Conferences were considered by the different sections of the Conference and formally adopted. Fresh subjects were also discussed at the District Conference and resolutions passed. Dr. Coleman, Director of Agriculture, and Dr. Sreenivasa Rau, Sanitary Commissioner in Mysore, presided over the Agricultural section and the Sanitation and Malnad Improvement section of the Conference, respectively, while Mr. P. G. D'Souza, B.A., B.L., Secretary to the Mysore Economic Conference, presided over the Industries and Commerce and Educational sections. The Educational section of the Conference included the Teachers' Conference of the District and was attended by nearly 300 teachers. Owing to the unavoidable absence of the Registrar of Co-operative Societies, the Co-operative section of the Conference was presided over by Mr. M. A. Narayan Iyengar, B.A., B.L., Deputy Commissioner. The Civil and Social Section of the Conference had Mr. M. A. Tirumalachar, Retired Assistant Commissioner, to preside over its deliberations. Lectures were delivered by Messrs. K. H. Ramiah, B.A., Bar-at-law, H. K. Mallappa, N. Narayanachar and K. Shankaranarayana Rau, M.A., B.L., on important and useful subjects. The Conference was brought to a close at 6-30 P. M. on the 5th March after the distribution of medals and certificates to the Village Improvement Committees that had done special good work and to other gentlemen who had rendered meritorious service in the economic development of the District. The District Committee had also arranged for demonstrations in mat-making, weaving with fly-shuttle looms, rattan work, carpentry, rope making, and flour milling. The modern method of castrating bulls was also demonstrated by the Veterinary Inspector. A peculiar feature of this year's conference was the manner in which the members were enlisted for the Conference from various interests in the District and the raising of funds for the expenses of the Conference.

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A NOTE ON THE NEED OF INDUSTRIAL SCIENCE.

BY THE RIGHT HON. SIR ALBERT
SPICER, BART., M.P.

THE progress of the war favours introspection on the part of the people of this country. There was a time when the Briton looked on complacently at the improving methods of industry and found the expansion of applied science quite rapid enough for his taste.

To-day we are asking ourselves whether the British manufacturer has even yet really perceived or appreciated the value of scientific research in industry. Speaking simply from my own experience, I certainly do not think the small manufacturers, or even those of some standing, have done so. And this is a point which is borne out by more than casual observation. It came out very distinctly in the evidence received by my colleagues and myself at the Sub-Committee of the Advisory Committee of the Board of Trade on Commercial Intelligence. That Committee dealt, among other points, with measures for securing the position of certain branches of British industry after the war. The enquiry referred to twelve industries, and in one case the evidence showed that even when a manufacturer had suffered a stoppage of his machinery because the war had taken away former German workers, he did not think of enquiring for help at the local University or Technical School.

Again, with regard to the question of raw material, it was very apparent that some manufacturers expected this to be left at their doors, almost as they expected their milk. The original source of their raw material had not been made a study. It is very evident, however, from the Report of the Privy Council Committee, that a change of attitude is taking place. The Scottish Shale Oil Manufacturers have established a joint research committee. The Federation of Master Printers are directing the attention of the Council to various substances used in their trade which hitherto have been supplied solely by enemy countries. There are also movements going on amongst the textile manufacturers of both Lancashire and Yorkshire, which indicate that here, as elsewhere, the exigencies of war-time are stimulating the inventive movement in industry.

But we cannot trust the problem entirely to these spontaneous efforts at research. I have sometimes heard it suggested that the solution may well be left until the war is over. I emphatically disagree. We ought to start as soon as possible, under existing circumstances, to interest manufacturers and others in the subject. It must not be supposed that there is dearth of material to form the basis of instruction, for knowledge is accumulating. As material is provided like that supplied by the first Report of the Privy Council for Scientific Research, who have already arranged for twenty scientific investigations of industrial importance, the information collected might, in the first instance, be scattered by means of short paragraphs

in newspapers and the interested trade papers.

It may be urged that this is not the time to expect the manufacturer to add the cost of research to his already multiplied risks. This argument seems to be based on the old fallacy that scientific research does not pay. But even admitting that all research is not instantly productive, I am far from suggesting that the charge for the advance of industrial science should not be distributed. The State, to begin with, should contribute its share through its grant to the Privy Council Committee. Then, I think particular research work undertaken for special industries should be carried out at the cost of those industries; lastly, special enquiries for special manufacturers should be paid for by the manufacturers concerned.

It should be evident from the suggestions which I have outlined that the part played by the State would be a very important one. It would be difficult to exaggerate the importance of the work which the Committee of the Privy Council is designed to carry out. The first report of this Committee strikes me very favourably. It shows a clear appreciation of the present position, and the suggestions for meeting the position seem to be thoroughly practical. As is well stated, the first condition of success is a largely increased supply of competent researchers, and towards this end financial help from the State and the grants already made, have enabled a start to be made. The second requirement is a hearty co-operation among all concerned. To obtain this co-operation it will be necessary to provide a constant stream of information, and this should be placed before the manufacturer, the trader, and the worker in a very attractive, indeed, almost in a popular style.

I was very glad to see in the Report the paragraphs suggesting the promotion of co-operation between different parts of the Empire in organization of scientific and industrial research. I found in Australia a few

years ago that there was a good deal of research work being undertaken in various Government Departments connected with the production of food. Brilliant climates produce brilliant developments of all kinds, and our Dominion Governments have been led to take up research work earlier than we have in our less congenial climate.

I had not an opportunity of enquiring as to whether in Australia they were also dealing with scientific and industrial research, but I should expect to find that they were, as there is no doubt that they are, very keen to do everything possible to develop the resources of their country.

In emphasising the need of diffusing knowledge in an attractive form, I must not omit a reference to the part which the Universities may play, and to some extent are already playing, in handing on the fruits of research.

Our Board of Trade Committee recommended that the Universities should be encouraged to maintain and extend research work devoted to the needs of the main industry or industries located in their respective districts; and the manufacturers engaged in those industries should be encouraged to co-operate with the Universities in such work, either through their existing trade associations or through associations specially formed for the purpose. Such associations should bring to the knowledge of the Universities the difficulties and needs of the industries, and give financial and other assistance in addition to that afforded by the State.

The University of Cambridge has already done much for engineering, Sheffield for industries in its own district, and Birmingham on the commercial side. I have no doubt that there are others, but these are the three with which I have come into contact.

Such is a general outline of the way in which knowledge of industrial science could, in my opinion, best be disseminated. Its application is a problem which will become

more urgent with every month that passes. The application of research is most urgently needed in two directions—first, where Germany has in the past taken away a portion of our trade, and, second, in those industries where German rivalry was threatening us.

I am not one of those who believe that in the application of science to industry, Germany has received an overwhelming start of us. I believe that even during the war we have made wonderful progress, and it is perfectly certain that, in providing for the needs of the war, we have been training tens of thousands of men and women in habits of precision and accuracy of which they have known nothing in the past.

What we have done in the way of production of articles necessary to carry on the present gigantic war, has proved that as a people we are as virile and capable as ever, and that if our natural leaders will lead, the people will follow, and far more successful times are in store for us than we have known in the past.

The following is from a report on the position of the import trade of Australia in July, 1917, by Mr. G. T. Milne, His Majesty's Trade Commissioner in the Commonwealth of Australia:—Imports from India have increased from about £2,223,000 in 1913 to about £3,680,000 in 1915-16. Jute goods, in the piece and made up, represent nearly two-thirds of this trade, while tea, rice, and other food-stuffs, as well as linseed, form the bulk of the remainder. The imports of pig-iron from Bombay have grown considerably during recent years. Five or six years ago Australian exports to India exceeded the imports, but this was owing to shipments of gold and silver specie and bullion. The exports of Australian food-stuffs, such as tinned meat and biscuits, as well as some minor items, have increased since the war, a considerable proportion of the purchases, presumably, being for Government account, while there have also been increased numbers of remounts shipped to India. Shipments of undressed timber for the Indian market showed some decline previous to the war, and have dwindled away to practically nothing at present.

THE REVOLUTION IN EDUCATION—THE PHYSICAL NEEDS OF CHILDREN.

BY MARGARET MCMILLAN.

THE human infant is the true exotic. In London, in Tahiti, in Lapland, in Italy he is a creature of infinite appeal and also of royal expectation. His soft limbs, his tiny hands curled like leaf buds, his rose-leaf skin, and vast head with its silent, wonderful promise of sleeping power, all these things proclaim him the flower of flowers. Nothing is more wonderful than the advent of the human, safeguarded till birth in every clime, and fed on the nectar of this planet's life, except the fact that after all these wonderful preparations he is born in mean streets and even in slums.

Into mean streets and very humble places, and into squalid places even, come the babies. The birth rate falls in Belgravia. It does not fall in Tooting, nor, above all in Deptford. In the poorest quarters, around doorsteps and in the alleys are crowds of tiny creatures, some washed and clean, some covered with grime, pale, and toddling on bent legs, and some vigorous even here. Even those who have to live on skimmed milk and crusts put up a great fight. They wilt and weaken from the first hour in seen, and unseen ways, but they struggle on. Nature has got them ready for life with lavish care. She has made them fairer than lilies, and softer than thistle-down. But she has done more. She has put a great will to live in these human blossoms. Nearly two-thirds actually manage to struggle up beyond infancy. Only one in four is killed outright.

Many live, but how many escape without injury? That is another question. The number of the wounded is greater than we imagined. Even with our new medical service, and the new Reports, we get very little

notion of the real scope, and the nature of human wastage in infancy and childhood. For after all the work is not only new. It reveals new aspects already that were unsuspected yesterday, and that are very dimly glimpsed to-day. Even the making of Reports depends on the existence of agencies that gather materials, and even where these agencies get to work the facts, and their meanings do not reveal themselves at once like a landscape under the rising sun.

DEFECTS IN CHILDREN.

Day by day as we extend our researches and go deeper and farther into the whole question of treatment for ailing children we come to see more and more clearly, first, that the number of little patients is so great as to include nine-tenths of all our child population; secondly, that the vast majority of these are suffering not from one defect, but from many, and finally that the beginnings of all this injury are to be found away back in the first year or years, the time when the tender little blossoms of humanity put up a great fight for life, but got, all unseen perhaps, a great many ugly wounds in the course of the battle. But not only diseases and defects, and weaknesses, mental dullness also and backwardness in later childhood can be traced to the first year or two when the baby mind worked in its own way, open to every kind of influence but could not find the things it needed, the things that would have been to it as the sun and rain and the good soil about the roots of the sapling.

Briefly, the human infant does not require a great deal of "medical treatment." He is, as a rule, born healthy, and he needs only the things that will keep him so. That is natural food or the best substitute that can be found for it, also a clean, warm cradle, fresh air, space, and freedom in safe places. All kinds of pleasant things, food and grassy places, also sweet voices and words, kind glances, smiles, and objects, he will take hold of in his own way, and that very thoroughly. He will learn any language,

however difficult, or even two. He will touch, taste, and handle freely, and he will make such rapid progress, and learn so thoroughly that nothing in later years can even compare with the progress of the first three years. And there is here no question of hurry, over-pressure, for babies do not learn like older children. They do not tax their brains, or wrinkle their brows. By the great highway of the sympathetic nerve, and mainly within the boundaries of the sympathetic system with its great terminus (the solar plexus) impressions, travel. With what ease, and freshness, and associations of pleasure in every organ do they travel at first. It is a long time since Séguin asked that we should leave to babies the blissful sensations of early learning, that we should let them touch and handle, and *dream* in peace "on the knees of their good mothers," and come forth from that baptism of life "thinkers, poets, men and women of action," that we should not "brutalise" them by requiring them to learn things with their heads before they have had any experience of them through lowlier organs. Alas! Very few even among the latest reformers realise that ideas must flow in the blood before they can be focussed safely in some part of the brain.

A HEALTH CENTRE.

Starved (in mind as well as in more obvious ways) anæmic, crooked, half-blind, with defective teeth, the children of to-day stand before us in a great multitude. Leaving their mentality out of account for the moment, the important thing one notes in a Health Centre, is, not that a vast number of children have bad teeth, or ear and eye ailments, but that the level of general health and muscular development for all children is a low one. It is rare to see a well-grown, well-nourished, "fit" child in the Deptford Health Centre, and when he appears the staff speaks of him with surprise and delight. "Here is a child with a really straight back!" This happy creature shines

out from over a hundred others whose backs are more or less crooked. "Here is a girl with really well-arched instep and straight limbs." She is a beacon of hope, a bright reminder that after all insteps are meant to be arched and limbs to be strong and straight. Here then is one root fact—a fact below all the ailing, eyes, ears, teeth. But there is another that is also worth grasping by those who care to go below the surface of things, and it is this. The state of most children is, in many respects growing worse from year to year. "Come early," says the surgeon, knowing well that if the child is over a certain age and has suffered a long time he may cure the disease, but cannot get rid of the deformity that it brought about. At fourteen the specialist in remedial drill gives up hope of a case she might have cured two years earlier. The dentist treated 700 very little children in nine weeks at the Deptford Health Centre. Children of fourteen are not to be saved so fast. It would have taken nine months to deal with them. And before that age, long before it, in the case of millions, other things that are as precious as straight shoulders and teeth, are in peril.

Our little children can and do learn to speak good English. They might also speak good French, and probably a third language. Our eight and nine year olds can and do, by dint of good and careful teaching overcome some very bad habits and learn to speak English. But our thirteen year olds are another question. They have no grip of any language. They cannot pronounce any of the vowels well, and have long given up taking any notice of some consonants. They are like pianos with silent notes in every octave. The teacher turns away from them at last, or faces them with sinking heart. She will have to spend five times the time and effort on them that she gives to the young. It is the same as regards hand-work. The four and five years have wonderful little hands. Such a fine touch sense, and such

deftness. They learn to swing circles, to draw, to model clay. But the elder ones have stiffened all over already. They find it hard to use their hands in new ways. It is as if the whole body had grown dull, while, as yet, the brain has not really awakened. The brain is a registering organ. It is not developed in the "forced" child, who registers very few original impressions.

WHERE FORMAL TEACHING FAILS.

Having watched ailing children streaming through a Health Centre (or rather through the school clinic of a centre) the writer became conscious that just as drugs and lotions, and even medical treatment cannot prevent disease, so the formal teaching of "subjects" in class rooms cannot revive the mentality of the average child. If physical education is to be taken seriously at all, it must be held to include the manner of learning at all ages, as a "well-defined physical process." We had ample evidence that these processes had been interrupted in the case of many of our children with very sad results. They had "headaches." They were apt to suffer from "over-pressure" and were at once excitable, yet so far as could be seen rather dull. It is common to accept such dullness as the heritage of the masses. All around us are people who have very few interests, and whose sympathies (outside the family circle) are very shallow. This condition, however, I believe to be induced, and not natural. A brain may be induced to do tricks at school while the great sympathetic system (so much older than the cerebral, and its nourisher and sustainer) is treated as a hunter treats a ditch, but this kind of activity is false and barren. We saw many of the cruder results of it in the low breathing capacity of our children, in the vacant eyes, and lax hands, and open mouths of some, but also in the irresponsible conduct, the lack of initiative, the dullness, and fickleness of many. We are not without evidence too, that others are vaguely conscious of the evil, though not of its origin. The loud complaints

of employers of labour against the national system of education are ever in our ears.

It is well to begin at the beginning but it is not always possible. Theoretically we should have started our new order of nursery and school with the babies. But we had to start with the children between seven and fourteen. A sleeping pavilion, and very simple bath house and work shed were put up in a cleared space behind the crowded street, at a cost of about £200. This is the home, practically, of fifty to sixty boys and girls (the girls have their own night camp of course) in summer and winter, and by night and day. Their parents and homes are close. They go home to dinner every day, but they have the other meals in camp. They bathe daily, and wash often. They dance, and play cricket; they learn to make cups and vessels from clay, to build a shelter, to plant, and dig, to cook a simple meal, and to draw on canvas. Also they attack the three R's with their whole body in the open, instead of taking them with aching head and tense forefingers at a desk. They are expected to learn, and *do* learn at a good swinging pace, but not before they have lived and have had an emotional life of some depth and reality. They learn in small classes of fifteen to twenty-five. They draw maps on the earth and floor, and they have rambles, and outings and also friends who write to them and send them post-cards, and who paint to them in words the charm of other lands and countries. They hear tales in the lighted pavilion after dusk. The night wind, and the dawn, the hail, the rain, and the rainbow are their friends, also the night sky, and the quiet companies of the stars. In winter they sleep and live outdoors as in summer, and their best health records were taken in January.

AN ORGANIC CHANGE.

Like silken skeins, long-ravelled, but still unbroken these little ones reveal to us the lovely order of nature. True, they do not become prodigies. I cannot even claim that they far outdistance others in their work. But the evil spell of the past is broken. The numb look, the confused or stolid glance is seen no more, but, in place of it, the blossom, and lovely grace of

awakened humanity. The change is an organic one, and has no element in it of that cleverness that is as restless and rootless as a ball in a box, and that distinguishes a good many scholars. For this new love, and beauty, and interest rise from the depths of the organic life and mount upwards without deception and without arrest.

The new educational part is not new. It is an old long covered trail—a trail that tends to be overgrown by every new and hastening civilisation. These civilisations tend to abbreviate and condense not only life processes but all its provisions and arrangements, and in the midst of this whirlwind of 'progress' the modes of life and growth peculiar to the very young are forgotten. Their physical need to learn, and enjoy, and take hold of the world by experiences and work that involves the activity of all the organs of the sympathetic system, (that "motor tramway" of the whole body) is ignored, or regarded very little, and the young are confronted with a life that cannot be lived in its fullness. They learn the abbreviations that are for them often mere catchwords. They cease to experience deep emotion, or feeling in learning. They learn superficially. The extent of the injury that has been done to them is indicated in the calm dictum "secondary" education is for the minority, and higher education for the few. The fact is that the average child is of high promise at birth. If the majority turn out flippant, or superficial thinkers, if their sympathies are narrow or shallow, and their interests few, that is because they did not live in the first years and learn as they might have lived and learned.

It is with this conviction that the camp-school has been started, and that its activities are planned so to include the children under school age. And short as is its history it has already given some evidence that Nature's reconciliations are free and ample—and that, the trail once found, there is no real obstacle that should keep us from following it. The cost of the school averages only £9 per annum for every child (inclusive). The capital expenditure in building is a little over £3 per head. Why then should any child be reared in a slum? The problem of the slum has been solved, once and for all, by the camp-school.

HOW SCIENCE CAN HELP THE FARMER.

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ONE need not look very far into the past to find ample proof of how science has helped the farmer. Anyone who has watched the development of the use of artificial fertilisers, cannot but be immensely impressed by the far-reaching influence of the discoveries of science in this sphere alone. It has enormously cheapened production; and if the farmer is unwilling to admit that he is any better off on this account he may be reminded that good authorities maintain that but for the use of artificial manures a great part of the arable land of Britain could not be maintained in cultivation under the economic conditions of to-day. But great as has been the effect of the discovery of fertilisers it is probably true that a large proportion of farmers derived no direct benefit owing to their inability to make the most profitable use of them. The amount of money that was wasted in building up the practice of their use by empiricism, or in contempt of scientific investigation should spur every young farmer to the study of science. It is pathetic to hear many a veteran farmer of to-day admit that had he known thirty years ago what he has laboriously acquired in that time, it would have been worth hundreds of pounds to him. But it is a truth well worth laying to heart that the ordinary tiller of the soil has still much to learn in this section of his calling, and could have a rich return from well directed efforts to acquire a knowledge of the scientific principles of manuring.

AN ENORMOUS CHANGE.

Again one has only to think of the enormous change in the practice of stock-keeping

to be equally impressed with the rapid development in this department of farming since scientific investigation began to shed even dim light on some of its problems. For centuries farmers fed stock empirically on what their fields produced, and as a rule made little effort to keep up the supply of fresh meat; for the surplus stock was killed off annually at the end of the period of plenty. But now no one thinks of fattening stock without drawing heavily on concentrated foods from abroad. These have all been discovered and are selected by the aid of science. It has been demonstrated beyond question that the methods of a generation ago would be impossible to-day. All stock farmers now feel compelled to use purchased feeding stuffs, and some of the most successful employ them so liberally that the bill on this account is frequently greater than the rent of the farm. While under the influence of science this transition from ancient customary methods to modern practice has taken place in a generation, still there can be little doubt but even the most advanced so far know little more than the elements of the subject, and further investigation is certain to be followed by far-reaching results. Practical men will most surely add to their profits by keeping in close touch with what is going on in this line. As an illustration it may be mentioned that feeding experiments carried out recently on a large scale by the Edinburgh and East of Scotland College of Agriculture show that in the consumption of the products of the farm the differences resulting from farm methods of feeding that are considered good practice in the same district may amount to more than the rent.

THE DAIRY INDUSTRY.

Let us next turn to dairy farming. This has grown in recent years into a great industry. So far it has depended more on hard work and crude practice than on scientific methods, and to-day it is threatened because the workers are rebelling against the

drudgery involved in ordinary dairy practice. Many hardly realise what this industry has done for farming. In many lands it has worked wonders in resuscitating agriculture. It was the salvation of the Danish farmers when crushed and almost ruined by the disastrous war which terminated in 1864. A few years later, when the Agricultural Crisis overtook British farming, and large grain-growing holdings became untenable, it was dairy farming that saved thousands from ruin, and laid the foundations of the fortunes of many of the most well-to-do farmers of the present generation. Probably no more outstanding instance of what this branch of farming did for British agriculture can be cited than the reclamation of Essex. In this case a large tract of corn-growing land within an hour's journey of the centre of London, was rapidly becoming derelict when it was saved by the migration of a few Scottish farmers with a practical knowledge of cows and hard work. They showed the way to the new farming, and to-day train loads of milk are sent daily to the centres of population, there are no derelict farms, rent-rolls have undergone a large increase, and anyone visiting the county now, is impressed with the farming and general appearance of prosperity. Is all this to pass away owing to the rebellion of the workers, can the application of science not relieve the situation?

FUTURE DEVELOPMENTS.

A suggestive feature is, that rapid as has been the development of the dairy industry, it has no more than kept pace with the increased demand for milk. The question naturally arises whether it has reached its full growth. A study of the *per capita* consumption of milk in large towns, and comparison of the figures with similar ones for country districts indicates that such an idea need not be entertained. We may therefore say: encourage the consumer by means of a more wholesome milk supply,

and there is little doubt but this valuable article can find a much greater place in the food of the people. This being the prospect we may well ask whether an industry which has done so much in its infancy for farming is to be strangled because the workers ask for better conditions of labour. Have those responsible for the direction of this industry looked as assiduously for assistance from science as they have for servants to work long hours amid disagreeable conditions? Perhaps the best answer to this question may be got by taking a wide survey. In the progress of civilization it is a well-known maxim that adversity makes for progress. For inspiration we may look to countries that have been harder pressed than ourselves. For this purpose we may again refer to Denmark. That country, owing to stress of circumstances, took to dairying nearly twenty years earlier than we did, and for the same reason it appears to have kept as much in the lead in its development. Ten years ago, we find that a deputation of Scottish farmers and men of science placed on record that they had traced the history and seen the fruits of a movement by which the farmers of Denmark starting with inferior native cattle, had produced in a quarter of a century, by careful selection and breeding cows of almost unequalled capacity for milk production. This is a line hardly touched so far by the British farmer, and it is full of possibility for him. It is intensive work involving a certain amount of risk that can be overcome only by application of scientific method to the practical work of farming. But that the fruits are undoubtedly there for those who deserve them is a fact that has been abundantly demonstrated in recent years by a few enterprising farmers in our own country.

SCIENTIFIC FEEDING.

While the keeping of milk records of breeding milking cows is an important step towards making the dairy farm a more

productive unit, another that goes hand in hand with it is the adoption of systematised feeding of the cows. In this line the Danes have also made remarkable progress. They set aside the idea still held by many dairymen in this country, namely, that high milk yield is a function of feeding. They have accepted the scientific dictum that the deep milking cow is born, not made by feeding, and they regulate the food according to the capacity of the individual to produce milk. To simplify this they have adopted a method of reckoning the various foods in standards or equivalent quantities that are more or less interchangeable. So many standards are allowed for the proper maintenance of the cow's body, and to that one standard is added for each 3 lbs. of milk produced by the cow. Shrinkage in the yield is followed by a corresponding reduction in the ration. Thus every cow gets sufficient food to sustain her natural milk yield at its highest level, but when this in the course of nature falls off there is no waste of food. The Americans at several of the experiment farms conducted in connection with the Agricultural Colleges are following the Danish practice in principle with excellent results. There is indeed every reason for believing that this system of feeding dairy cattle is highly commendable, being scientific, economical, and profitable. What its adoption would do for the farmers of this country may be gathered from the results of investigation into the feeding of dairy cattle on a large number of farms in England. This work is at present being carried on in countries in the vicinity of Wye and Reading by the staffs of the local agricultural colleges. It has already shown that the cost of food per gallon of milk produced on these farms varies enormously, and may easily be double in some cases what it is in others. Similar investigations disclose a like state of affairs both in Yorkshire and in Scotland. Surely the time has arrived when such findings should be no matter of indifference to the rank and file of milk

producers. We have said enough to make it clear that there is room for great improvement in British dairy farming, and to indicate how this may be accomplished. Those who will bring science and organizing capacity to bear on the practice of dairying may be assured of the ample reward.

MAKING WORK MORE AGREEABLE.

So far only outstanding instances of how science can help the farmer have been cited, but there are many more. Indeed they are almost innumerable. By no means the least are those connected with the economy of labour and the betterment of the conditions of the workers. We have already alluded to the labour difficulty in dairy farming. The question may be asked—has everything practicable been done to make the work easier and more agreeable? Anyone who has travelled through the dairies of the world will readily answer "No—not by any means." Much of the dirty, disagreeable work of the dairy can be made lighter and more pleasant by properly constructed byres, and well contrived mechanical appliances, such as scarcity of labour has induced farmers in the new World to accept as a blessing. We may refer specifically to the overhead monorail and the suspended wagon which so much facilitates the feeding and cleaning of cows in many byres, on the other side of the Atlantic. But it is not necessary to go so far for examples of improvement. One finds here and there a man of ingenuity who scraps his antiquated boilers, replaces them by a steam generator, and at a stroke sweeps aside a large amount of disagreeable work. Incidentally in a short time he often saves as much on fuel as meets the cost and then wonders why he tarried so long before adopting the improvement. Indeed the possibilities of science as the handmaid of agriculture are great and far-reaching. The only limit is the perception of man. Farmers of the past have been wont to depend on the practice of farming rather than on the scientific aspect of it. Let it now be recognised that the successful farming of the future will depend as much on the cultivation of the brain as on the cultivation of the field.

AGRICULTURE IN MYSORE,

1916—17.

BY "RUSTICUS."

THE Report of the Agricultural Department of our own State is the most difficult to review of any which come to us owing to its miscellaneous character. That is not, in any way, a reflection on Dr. Coleman and his staff. It does not mean that they are dissipating their energies in too many directions instead of concentrating them on a few main lines of work. It is simply the result of the miscellaneous nature of the crops grown in the State. Mysore has not, as have nearly all the British Provinces, two or three outstanding crops such as wheat, cotton, rice or jute, to which the Agricultural Department can devote most of its attention and with accounts of the work on which the Director can fill up large sections of his Report. It is difficult to say which is the most important crop grown in Mysore. Taking the gross value of the outturn per acre and possibly also the net return, sugar-cane is certainly the most valuable and it is therefore entirely appropriate that the most interesting and important results obtained on the Government Farms during the year were from the work on sugar-cane on the Hebbal Farm. It has now been definitely established that the Red Mauritius variety is the most suitable for the State. At Hebbal last year, it gave an outturn of 41 tons of cane to the acre which made 420½ maunds of jaggery valued at Rs. 961. The money return was almost exactly Rs. 100 an acre above the two best local varieties "patta patti" and "cheni". Curiously enough, at the other end of the scale, came the only other Mauritius variety tried, the Striped Mauritius. On the Marthur farm, the Elephant variety beat Red Mauritius by 24 maunds an acre, the respective yields being 357 maunds against

323. The Elephant cane has, however, as might be expected from its name, the great drawback of a huge diameter which makes it necessary to split it before crushing, as it cannot be fed whole to a bullock mill. Even for the Shimoga *malnad*, therefore, of which the Marthur farm is a typical area, Red Mauritius would seem to be the most suitable cane. It is not only in regard to varieties that the work at Hebbal has yielded results that may be regarded as conclusive. The manuring and spacing experiments have been equally fruitful. The application of a ton of cotton cake resulted in a net increase of Rs. 147 in the return per acre and that of a second ton in a further increase of Rs. 101. The usual practice in the eastern part of the State is to plant cane in rows not more than one foot apart. It has been found at Hebbal that planting two, or better still, three feet apart gives a greatly increased yield in addition to the very considerably saving in seed it effects. Dr. Coleman would certainly seem justified in holding that the Department has now three definite recommendations to make to sugar-cane planters in Mysore, to grow Red Mauritius in preference to all other varieties, to use oil cake at the rate of at least 100 lbs. of nitrogen per acre and to plant in rows at least two feet apart. He considers that, if these recommendations are followed, the profits from sugar-cane cultivation will be increased by at least 100 per cent and in many cases by as much as 200 to 400 per cent.

Next in importance to the work on sugar-cane at Hebbal came that on *ragi*. Although the rainfall for the year was about one and a half times the average and there was thus an ample supply of moisture in the soil, the results of the year confirmed those of previous years in pointing to the advisability of some form of autumn cultivation, as the autumn treated plots continued to give better yields than those on which no cultivation was done till the spring. The

experiments in rotation showed that *ragi* grown after groundnut gave a 25 per cent better yield than when grown after *ragi*.

Areca is the principal crop on the Marthur farm. The condition of affairs there was testimony to the efficacy of the work done by the Department in previous years for there had been no outbreak of *koleroga*, the most important of the diseases which attacks areca, for three years. Last year the garden was left alone to see what would happen and the result was an outbreak of some virulence on account of the abnormal rainfall. No better evidence could be desired of the value of spraying or of the truth of the maxim that "prevention is better than cure." Work on the other two farms, at Babbur near Hiriyur and at Nagenahalli near Mysore has hardly started yet, the land in both cases having only recently been acquired. Both are intended to serve as demonstration as well as experimental farms. The main lines of work at Babbur will be on cotton and jola and at Nagenahalli on sugar-cane.

All the farms with the exception of that at Nagenahalli served as centres for the distribution of seed and manure and for the demonstration and sale of ploughs and other agricultural implements. The introduction of improved cultivating implements is a point to which Dr. Coleman attaches very great importance as he considers that the experiments on the Hebbal farm shew that, in all conditions, the early cultivation of drylands in Mysore leads to an increased crop the following year. One interesting point which the work of the Department in this direction has brought to light is that mere cheapness does not appeal to the ryot and that, if he buys improved implements at all, he likes to buy the best available. For this reason, the bar-share plough made by the Public Works Department, though sold in fairly large numbers, did not make the progress expected from it. It is not so well finished as the more expensive

Kolar Mission and Syracuse ploughs and the latter therefore continued to be preferred in all parts of the State in which they had been introduced at all extensively.

The importance of distributing good seed and of the establishment of seed farms for the purpose is as fully recognised in Mysore as it is in British India. It is also recognised that it is work of which private agency should relieve the Agricultural Department to a very great extent in order to enable the latter to utilize its energies in other equally important directions. Dr. Coleman hopes in time to have the whole State covered with a net work of private seed farms for the distribution of superior varieties of cane. He does not say how many of such seed farms there are already in existence but that there are a fair number would appear from the fact that, during the year, 175,000 sets, chiefly of Red Mauritius cane, were distributed, partly from the experimental farms and partly from the seed farms. The arrangement under which operations are conducted is that seed cane is distributed free from the central farms on the understanding that double the quantity is returned to the Department the following year. All expenses of transport are borne by the latter but the grower binds himself not to mill any of the cane grown from the seed supplied to him and to sell back to the Department at market rates any of the cane which he does not require for his own seed. In the Government review of the Report, the Director of Agriculture is asked to give some indication in future years of the exact increase in production due to the work of his Department, both as regards commercial and other crops. Dr. Coleman has attempted to do this in the year under review in the case of sugar-cane only. He estimates that the work of the Department in regard to this crop, including the introduction of improved seed, the distribution of oil cake as manure, the demonstration of improved methods of jaggery manufacture and the

spreading of cultivation in new areas must have increased the value of the crop by at least Rs. 1,00,000 during the year. It would have been interesting to see how this figure compared with the total cost of the Department but the figures for the latter are not given.

Turning to district work, the increase in the number of improved implements sold must be regarded as very satisfactory, especially in view of Dr. Coleman's opinion mentioned above and of the difficulties consequent on enhanced prices of all materials and lack of transport facilities. In the Eastern Division, the number of ploughs sold increased from 535 to 765 and in the Western Division from 394 to 441. Seventy-three cultivators were sold in the Western Division against fifty-four the previous year. The number sold in the Eastern Division fell from twenty-five to twenty-one the reason being that the price of the Kolar Mission cultivator which is the one most liked went up on account of the war. In this connection, the increasing demand for the Nahan sugar-cane mill should also be mentioned. It was specially unfortunate, in view of the limited supply, that many of the mills supplied by the Public Works Department were unsatisfactory and showed frequent breakages. There can be no doubt that such occurrences are harmful to the popularity of the Department with the cultivator, who is apt to consider that a Government Department should never make mistakes. Space prevents us from entering into the details of the many other useful lines of work carried out in the districts, though the increase in the growth of sunn hemp for manure purposes and the consequent demand for seed deserves notice as does the introduction of indigo. It is true that only a small beginning was made with the latter crop but even small beginnings are of great interest in the case of a new crop. Twelve acres were grown in the

Chikballapur Taluk, from the crop on which six maunds of dye were manufactured and sold at Rs. 120 per maund or three times the normal price. It is hardly surprising, in these circumstances, that the cultivation is extending. We should have been glad to see a very much larger increase in the area on which the economic transplantation of paddy was carried out especially as the increase in the yield per acre in the Chitaldrug district as the result of the adoption of this method was estimated at 50 per cent. We cannot agree with the Report that an increase from three-and-a-half to twenty-eight acres in the Kolar District was 'noteworthy.' Dr. Coleman evidently considers that the main obstacles to progress in this direction is lack of fieldmen. In Mysore, as elsewhere, the cry of the Agricultural Department is "staff and yet more staff". This brings us naturally to the subject of agricultural education. The Hebbal Agricultural School had another successful year. Two satisfactory features in connection with it are the increasing extent to which District and Taluk Committees are co-operating in popularizing it by the grant of small scholarships and the fact that about 50 per cent of those who have passed out of the school are cultivating their own lands. It would have been of interest to know how many of the students of the school have entered Government service and whether it is the idea that the Department should look to it for its supply of Agricultural Inspectors. Dr. Coleman has great hopes of the Vernacular Agricultural School at Chikkanahalli as a recruiting ground for fieldmen.

The question of the type of agricultural education, if any, which should be given in rural schools has been very much to the fore of late. Numerous Conferences have been held in regard to this and other aspects of agricultural education but it cannot be said that much progress

has been made in coming to conclusions. Dr. Coleman is therefore to be congratulated on taking steps to get something done. He disagrees with the view that it is a mistake to attempt anything in the way of agricultural education in the ordinary vernacular schools. He holds that the instruction usually given in village schools is not of a character such as to fit the pupils for their life work in the best manner possible but that, if the organization of agricultural schools to meet the need for a suitable education is awaited, it will be a matter of hundreds of years. He has therefore made a beginning in the organization of rural science classes in four selected schools which are easily accessible and have a fair number of pupils of twelve years and over, for whom the instruction proposed seems suitable. The Head-masters of the selected schools have already undergone agricultural training in the Mysore Normal School, and three out of the four were given a course on the Hebbal Farm in May and June, 1917. The work at the schools is supervised by a Rural Science Supervisor, who visits each of them once a week. The Educational Department has provided for the inclusion of the special instruction in the curriculum of the schools. Considerable difficulty was experienced in securing suitable land for practical work but this has been overcome to a large extent by the generosity of private donors. A piece of irrigable land is, however, still wanted for the school at Varthur in the Bangalore Taluk and at Hunsmarnahalli in the Devanhalli Taluk, the only land available so far is a plot of very poor sandy soil. Dr. Coleman's experiment seems calculated to throw light on many vexed questions and will be watched with much interest.

It only remains to add that much useful work continued to be done by the scientific sections though it was of somewhat too technical a nature to justify detailed

description here. The most important work in the Mycological section was the further investigation of the Spike disease of sandal. In the Botanical section, the *ragi* breeding work has got so far as to warrant the distribution of five individual selections and seed sufficient for forty crops has been sent out for trial. The main line of work on sugar-cane was the raising of seedling canes of Red Mauritius. Dr. Coleman looks forward to an increase in the yield of *ragi* in the State by 15 to 20 per cent by the introduction of improved strains and in that of sugar-cane by about 20 per cent. It follows that, if the introduction of better varieties is accompanied by the adoption of better methods of cultivation and greater use of manure, not only in the case of sugar-cane and *ragi* but of other crops, there are tremendous possibilities in regard to the increase in agricultural production throughout the State.

Some of the most important industries are located in Bombay, and it is gratifying to read in the Bombay administration report for 1916-17 that its cotton mills were exceptionally prosperous. Their number increased by five and they had an extended market not only in India but also in Mesopotamia and East Africa. Unfortunately the output of yarn decreased and the bulk of the indigenous hand-loom industries, that support a many times larger population than the factories, suffered for lack of raw materials and from high prices. The match making industry was, we read, seriously handicapped by the impossibility of obtaining the necessary chemicals and of withstanding the Japanese competition. The factories in Belgaum, Karad and Dharwar did not work at all. The glass factory at Talegoan turned out work valued at Rs. 20,000 only. The glass bangle factory at Kapadgunj and some soap factories thrived but the dye factories suffered.

THE INDUSTRIAL SITUATION AFTER THE WAR.

BY GEORGE J. WARDLE, M. P.,
Chairman, Labour Party.

IN no part of our industrial life has the war brought such drastic changes as in the realm of industry, and this is true both of the actual circumstances of the present time, and of the problems which it has raised for the future. The first effect of war is to create unemployment, and this was true of the present war, as of others. This effect was specially felt in the first instance as regards women, though, fortunately in the case of both men and women, it was a short-lived crisis. In no single instance have the prophets been so egregiously wrong, nor the fears of the pessimists proved such liars. In the early days of the war so great was the concern, even of the Trade Unionists, at the grim spectre of possible unemployment, and the prospective drain on their funds, that they petitioned the Government to make special provision, by granting subsidies to those Unions which would be hard hit by "out of work" payments. These special arrangements were actually made, but so quickly did events falsify the fears which were entertained, that only in the case of one industry, namely, the Cotton Trade, has the subsidy been called for, except to the very smallest amount. What unemployment was brought about was due to dislocation, rather than to shortness of work, and as the men flocked to the Colours in ever increasing numbers, the excess gave way to shortage. This shortage has become more pronounced, as the number of men available became less and less, and it has become still more accentuated since the passing of the Military Service Acts, with the natural consequence that women have been brought into the Industrial arena in larger and still larger numbers, and into

trade after trade where they had not been previously employed. This only became possible because Trade Unions relaxed their rules and actively co-operated in teaching women the various processes of industry which had hitherto been their special preserve. This great and even extraordinary extension of the employment of women during the war has provided one of the most serious problems of the months which have passed, and complicates the future settlement of the industrial situation when the war is over. It is not possible to give any exact estimate of the extra number of women now employed in industry, but it cannot be far short of a million. Many of these may only be those who have transferred from domestic service or non-essential work, to the producing industries, but even when all allowance has been made for these, the number of new women workers is very great. It is safe to assume that the change will be permanent in many trades, though there is always in the background, the solemn pledges given to men who enlisted that their work should be open to them on their return, if they are physically fit and capable for it.

Apart altogether then from the promised restoration of Trade Unions' conditions, the problem of the absorption of all the men and women who will be demobilised on the return of Peace takes three forms. There are

- (a) The men who constitute the Army and Navy, and whose services as fighters will no longer be required.
- (b) Those who are employed in the making of Munitions either in Controlled establishments, National Factories, or for private firms.
- (c) The women who have taken the place of men or gone into industries of a temporary character.

The displacement which took place by the withdrawal of so many men from ordinary production and distribution to the fighting

forces, and the mobilisation of the immense quantities of Labour required for Munitions and Transport for the war was a great task, but it was simple compared with the problem of what I may call their repatriation to re-absorption into industrial life once more. At present they are not engaged in creating National Wealth. The Country is living on its Capital. It is piling up debt at a terrific rate. All the guns and all the shells will not add a single farthing to our capacity to provide for the sustenance of the Community. It is necessary for security and because it is necessary, we have to bear the burdens which war imposes. It is useless for sustenance. When the war is over we have to face the financial problems which cannot fail to be onerous and at the same time to provide not only nor mainly for the present victims of the war, but also for the able-bodied men and women whom we have taken from their ordinary avocation for the purpose of winning the War. The basis of all wealth is production. Hence we shall require to organize our National resources to secure sustenance for our people. It is as necessary in this direction to secure National Co-operation, as it has been to do so during the war. The task which faces us is immense. The transition from the state of War to that of Peace will probably produce a dislocation of industry to which history furnishes no parallel and for the solution of which no temporary half measures will be sufficient.

In the three categories named there are probably from seven to eight millions of workers now being paid out of public funds who will require to be dealt with. The danger of a sudden transference, or a too rapid demobilisation has been often dealt upon and I need do no more than say that any process of re-absorption into civil life must, from the very nature of the case, be gradual. For one thing, it is physically impossible to disband the Army at a greater rate than say, probably, 30,000 per week.

For another it would be the greatest possible folly to attempt to get rid of the men who are at present in the Army at a stroke. Industry would be paralysed, transport would not be sufficient to cope with the emergency, and the results would be grave both to the individual and to the Community. It is, therefore, with great relief that we learn that the problem is not being left to solve itself, and that Government Committees and Labour Organizations are already mapping out plans for dealing with the emergency when it arises. The idea that the men and women who have served the Nation in its hour of extremity should be suddenly turned adrift without resources is unthinkable. I am, of course, excepting those whose employment is guaranteed and of whom there are a great number. But in the case of the others also, there is to say the least, an implied guarantee which it is the duty of the Nation to honour.

The first essential is that the problem should be thoroughly explored, and then that the process of demobilisation should be gradual. Regard should be had to the state of the Labour Market in particular industries and in different districts, so as to prevent any congestion of unemployment and so as to supply labour where it is most required for the revival of production on a peace footing. It is better to keep the men as soldiers than to turn them suddenly and without resources on the Labour Market.

As the men are distributed, suitable care should be taken to see that where possible they should have work to which they can go. Where this obtains, there is no object in delaying release. Where it does not the year's unemployment benefit promised to the returned soldier should be immediately available, and there should be no gap between the cessation of his pay, and the beginning of the unemployment benefit. Similarly provision should be made for the Munitions workers, though in my opinion, the better plan in their case would be to

follow on similar lines. The Government should continue to exercise supervision over Controlled Establishments, and retain its management of National Factories for some time after the War, only gradually returning the former to peace work when they could show they had sufficient orders to keep them going, in the meantime utilising both Controlled Establishments and National Factories for the necessary work of rebuilding the ruined industries and restoring the destroyed homes of the devastated territories where the ravages of War have played such dreadful havoc. No question of profit should enter into this work. It is work to which we are pledged. It should serve as an excellent feature of the transition stage, and would be the means of cementing the bonds which unite the Allies still closer.

Its main result, however, would be to guarantee the gradual return to normal conditions and to steady the Labour Market. All these suggestions apply to women.

It is evident from this that the Employment Exchanges will come to mean more than they have ever done in our National life. The Trades Unions have never taken very kindly to them in their present form, nor have Employers found in them the assistance which was expected. The work of repatriation is National in its character and requires some National machinery which is in close touch with local life and needs in order to carry out the work effectively. Proposals for the radical reform of the Exchanges are therefore being made. They must be brought into closer touch with the Employers and the Trade Unions. They must be less bureaucratic and more humane and for that purpose, Local Committees of Employers and Employed in equal numbers should be constituted, and these should be given some real powers of supervision and control which would guarantee their effectiveness in dealing with this problem.

It is no use attempting to disguise the fact that the onerous financial burdens we shall

be called upon to bear as a people will make it essential that production should be stimulated as rapidly as possible and that an increased output must be got. But those who talk lightly about breaking the solemn pledges given in regard to the restoration of Trade Union Rules are going the right way to create trouble. Our industrial future depends upon our realising as the first and fundamental basic factor, a right relationship between Capital and Labour, or rather I should say, between management of industry and the workers. Whether it is possible or not depends on both sides. Pre-war conditions are impossible. A better standard of life is imperative. Higher wages and shorter hours are essential. The increased leisure and the greater purchasing power will in themselves result in an increased output, and as to the rest, all will depend on how the mutual relations between the State, the Employers and the Workers are settled. Given the will for effective co-operation, given the best conditions of labour possible, and above all, given the abandonment of the idea that the worker is simply an instrument for the production of profit for others, and there is no need to fear the future of industry in this country.

Experiments conducted by Mr. James Weddell, of Natal, for the purpose of ascertaining the value of wattle extract for dyeing purposes, says, South Africa, have so far proved successful that he claims to have obtained some thirty shades, ranging through browns, drabs, greys, and fawns. Tests made with woollens and cottons were satisfactory, the effect of washing being rather to darken the shades than otherwise. The secrecy which formerly surrounded the German dyes have been denounced by Manufacturers as a myth and it has been that equally fast dyes can be obtained from several woods with permanent effects. Some of the khaki shades issued to the South African soldiers at the beginning of the War were most disappointing, for they would not stand a wash, being apparently produced in a hurry. Should the wattle shades prove to be lasting another industry will be added to the list already growing in South Africa.

COTTON MANUFACTURE IN INDIA AND CHINA.

BY ROBERT W. BROCK.

The winds grow high ;
Impending tempests charge the sky ;
The lightning flies, the thunder roars ;
And big waves lash the frightened shores.—*Prior.*

THE cotton mill industry of Bombay is the storm-centre of industrial India. It was the child of speculation and has been the prolific mother of industrial and political strife and disturbance from the day of its birth. The *Times of India* has recently denounced the "insane speculation" connected with the yearly cotton settlement, the financial embarrassments connected with which drew from *Capital* the rebuke that "It is curious, but true that every financial difficulty—every needless difficulty—the Government of India has been forced to face since 1914 has originated in Bombay." Bombay, in short, was accused "of rocking the boat when every other important city in the Empire is doing its utmost to steady it". To this indictment the financial expert of the *Times of India* retorted valiantly, but not very effectively, that,—whatever may have been the financial embarrassments encountered by the Government of India in endeavouring to weather the recent cotton settlement, while he remains in Calcutta "the Controller of Currency never gets a clear insight into the currency problems of India by being located in the most retrograde and sleepy currency centre in this country. If the Financial Secretary were in Bombay, or the Controller of Currency had his head-quarters here, Government would keep in live touch with the bullion markets and through them with the currency thoughts of the people of India. The moulding of the currency and financial policy of India is vested in the highly intellectual and sensitive bazaars of Bombay

and to ignore their feeling and their idiosyncrasies is tantamount to taking a short cut to derangement and confusion. The Finance Minister would have been certainly saved the 'acute anxieties' which he mentioned in the concluding portion of his farewell budget, if the Financial Secretariat had been in Bombay. Millions of money would be saved and the war more efficiently conducted by the Imperial Government taking up its head-quarters in this city".

To those who know recent financial and commercial history this pose of innocence in this part of Bombay is not very impressive. The acutest anxieties encountered by the Finance Member have been those connected with the swadeshi banking, silver, and cotton crises and all these disturbances had their storm centre in Bombay. It was Bombay again that was at the back of the British political crisis concerning the cotton excise duties. The main burden of war taxation has fallen not on Bombay, but on Calcutta. This may be indicated by mentioning the successive impositions of new taxation upon jute and tea manufacture. The chief taxation affecting Bombay since 1914 has been the higher duties imposed upon imported cotton piecegoods. The outcome was higher profits for cotton mills! Bombay is, in fact, in many ways becoming the spoilt child of India, and like other spoilt children, its sense of gratitude is often overriden by its power and readiness for mischief. As the sequel to the cotton settlement it is reported that the Government of India intend to force the establishment of a Bombay Cotton Exchange. To again quote the *Times of India*: "The insane speculation in the cotton market is not a new thing; it is one of the hardy annuals of Bombay, but this year it has reached gigantic proportions. Out of evil cometh good; the loss and disturbance caused by this Broach Settlement will not have been in vain if it leads to a determination to cut at the root of the evil by establishment of a clearing

house and broadening the basis of the settlement". This view will be cordially endorsed. It has long been clear to business men, and it must now be clear to Government, that the yearly cotton settlement is the most dangerous anachronism in our commercial structure. As I have ventured to suggest in another journal, "there is only one sound form of treatment for half-hidden rocks dangerous to financial navigation—it is the application of explosives which we advise Simla to use without further delay. It is a case quite evidently of destroying or being destroyed".

I think it can now be said that, in view of the attitude of the Government of India and of the saner elements in the commercial community at Bombay, the yearly cotton settlement is doomed to early extinction, and will give place to a "logical Cotton Exchange of sufficient moral authority to discipline the rowdy spirits who prefer one furious boat of gambling to the steady long-drawn-out legitimate which is so beneficial to trade and commerce. Once we have a Cotton Exchange with charter there will no longer be any use for an appeal to official empirics to set right a world gone out of joint."

I will deal in later paragraphs with other respects in which the cotton manufacturer's world is "out of joint," but, to secure the right atmosphere, and to enable ourselves to view the cotton industry in correct perspective, let us search for its origin. In proof of the assertion that Indian cotton mills were "the child of speculation" it may suffice to quote Sir D. E. Wacha, Chairman of the Cotton Millowners' Association, who, in an analysis of the history and status of Indian cotton manufacture in the "Investors' Year Book", set down the facts as follows:—In 1859, he asserts, the exports of raw cotton amounted to 642,000 bales of 400 lbs. each. The great bulk of the cotton exports at this period of the history of the trade went to the United Kingdom to feed the

Lancashire mills. These mills consumed in 1850 an average of 750 million lbs. of Indian and American cotton. Between 1855 and 1860 the average consumption rose to 947 million lbs., but owing to the American Civil War supplies from America fell short, and the average consumption in 1864-65, the most critical year in the Lancashire cotton industry, fell to only 628 million pounds. India was, however, able to take advantage of the position, and to increase her exports to a very large extent. The average exports of Indian cotton to the United Kingdom prior to the outbreak of the Civil War amounted to 528,000 bales, and during the five years of the war the exports rose to an average of 973,000 bales. The economic effect of this large increase in exports was that an enormous quantity of money poured into India, and more particularly into Bombay, and gave rise to speculation much on the scale of the South Sea Bubble in England in the eighteenth century. An extraordinary number of mushroom banks, financial institutions, industrial and shipping companies, sprang into existence with lightning rapidity. With the cessation of the war and a return to normal conditions the speculation collapsed like a pack of cards, engulfing thousands of persons in hopeless insolvency. The evil, however, wrought in its train one great good. Bombay took a new departure, and, on the ruins, which this gigantic speculation left behind it, was reared the foundations of the present cotton industry, which has done so much to enrich the city of Bombay. Cotton factories began to rise rapidly in the city, and in various parts of the Bombay Presidency, while the extension of cotton cultivation largely increased to meet the increased demand for the raw material.

To-day, despite various periods of depression, and notwithstanding alleged fiscal handicaps, cotton manufacture is the leading industry. According to figures issued by the Director of Statistics, cotton spinning

and weaving mills, of all important industrial establishments, employ the largest number of operatives (nearly 275,000), closely followed by jute mills with over 251,000. The largest number of establishments belong to the cotton ginning and pressing industry. Of the 278 cotton mills, 181 are in the Bombay Presidency, with an aggregate number of 188,625 operatives, or 69 per cent of the total. Madras comes next with 26 mills and 23,564 persons. The United Provinces contain 17 mills with 16,779 persons, the Central Provinces and Berar 14 mills and 14,952 persons, and Bengal 15 mills and 10,394 persons. There are in Bombay 486 cotton ginning and pressing mills employing 36,451 persons. In the Central Provinces there are 415 mills with 29,572 persons; in the United Provinces 156 mills with 15,414 persons; in Madras 116 mills with 10,093 persons; in the Punjab 135 mills with 9,452 persons; in Central India 93 mills with 7,130 persons; in the State of Hyderabad 140 mills with 6,131 persons; and in Baroda 62 mills with 6,005 persons.

Sir D. E. Wacha, in his address as Chairman of the Millowners' Association alluded the other day to the grave difficulties—created by current conditions,—that, at the present time, tend to hamper the normal working of cotton mills. Prices, he said, of some of the principal articles of mill consumption have mounted, in the last three years to extraordinary figures. For instance, the price of the following articles in 1917, compared to those recorded in 1914 were as follows: Aniline dyes 847 per cent; tanned skins 572 per cent; bleaching materials 250 per cent; sulphuric acid 203 per cent; caustic soda 131 per cent; starch 57 per cent; and tallow 48 per cent. Never in its whole history, now extending over half a century and more, has the cotton industry of the country been subjected to embargoes, of the character just referred to. Wars there had been during that period. So also

famine, pestilence and other untoward physical calamities. Those had, no doubt, temporarily arrested its smooth and orderly working. But the experience through which it is passing these three years and more is wholly of a new character and exceptional in its consequences.

These, fortunately, are merely temporary problems and, moreover, are offset by various advantages created by war conditions, including—to mention only three—the restrictions upon imported cotton goods, the opening up and exploitation of new markets, and the fiscal advantages conferred in the Government of India's Budget of 1917-18. There are other problems, more serious, and unfortunately much less transient than such temporary obstacles as high prices of mill goods, and to some of these problems it may be useful to draw attention. They include such knotty matters as the housing and wages of operatives, the regulation of gambling in raw cotton, the promotion of textile research, and the devising of means to counter the increasing importation of cotton piecegoods from Japan. Looming on the horizon is the growing range and vitality of the cotton manufacturing industry in China. Another problem raising very knotty points is *post-bellum* fiscal adjustments. There is also the vital problem of growth of long staple cottons. The latter problem, as is well-known, is under investigation by an authoritative and strongly composed Cotton Commission appointed by the Government of India. This body has completed its investigations and is engaged in framing recommendations.

The dominant factor in all these problems, or most of them, is finance, and it may be wondered why the Government of India do not jump at the opportunity offered by their maintenance of the old cotton excise duty to solve the entire bunch at one sweep. The basic suggestion is that the proceeds of the cotton excise should be allocated to purposes directly benefiting cotton mills. Were

the Government of India to accept this principle, the rest would be easy, inasmuch as the fifty lakhs rendered available each year would facilitate the solution of the problems of housing mill operatives and educating their children even while also providing ample funds to encourage textile research and leaving a bit over to subsidise early efforts in encouraging the growth of long staple cotton. In this connection there are various important points to be noted. Concerning the cotton excise duty it is evident that its imposition is either just or unjust. If it is just, then there was no justification for recently raising the import duties upon cotton piecegoods while retaining excise dues at their old level. On the other hand, in the event of the excise duty being regarded as constituting an arbitrary imposition, the fairest course would be either to abolish it (which would be inexpedient), or a policy dependent entirely upon opportunist considerations—utilise it, as suggested above in aiding the industry. I am well aware that many millowners would oppose the adoption of this policy. I will, however assume, for the sake of argument, that the principle of allocating the proceeds of the cotton excise duty for the direct benefit of the cotton industry is unreservedly accepted. We must then see in what directions the funds rendered available could be most advantageously expended.

I may be permitted another quotation from Sir D. E. Wacha's recent address to indicate the views of intelligent and progressive cotton employers concerning the vital questions of housing and education. He says :—

"I, for one, distinctly hold the opinion that the education of the children of the working classes and the provision of sanitary dwelling houses for these classes are duties which primarily appertain to the Government. It is the province of the Government and Government alone and not of any class of employers. This duty has been fully recognised by all the civilised States of the world. The Government which fails to recognise or which ignores it is guilty

of a great crime against the society whose social welfare it affects to promote. Under the circumstances I exceedingly regret the disappointing, if not evasive, reply which the Government of India made to my interpellation on the subject of sanitary dwelling houses for the working classes, during the recent Legislative Session at Delhi. But I sincerely hope that H. E. the Viceroy, with his large experience of such matters in the London County Council, will be able to make his colleagues fully alive to the responsibility and press them to formulate a well-reasoned and practical scheme for the gradual housing of the working classes in the different presidencies and provinces of India. I admit that large employers of labour everywhere have their own duties and responsibilities to discharge so far as the internal arrangements of their factories are concerned, about the health, comfort and general convenience of their employees. On the other hand, the Government also has its own proper duties to discharge so far as the general health and comfort of the labouring classes are externally concerned, namely, as to their dwelling houses. It will never do to shift that responsibility on the employers. Employers can certainly be invited to co-operate with the State. Their own instinct of self-interest must prompt them to assist the State in accomplishing its humanitarian object. But I emphatically repeat that the duty of providing sanitary dwelling houses for the working classes primarily rests on the shoulders of the State and the State alone. Similarly the responsibility of imparting elementary education to all children of a school-going age (not factory children exclusively) in all parts of the country devolves on the Government. But it will never do to shirk that responsibility and coerce large employers to discharge that duty. That seems to me to be really inverting the social order. But on this subject, too, I need not say aught further since, sooner or later, the Government of India will be compelled by the Secretary of State to follow Mr. Fisher's wise policy of elementary education so far as children employed in all kinds of factories are concerned."

Appeals from Government to cotton mill-owners to house and educate their operatives have induced no practical response. State action is consequently imperative. An intelligent opportunism would, I think, tend naturally to use the funds derived from the excise levy as the natural basis of such action. Better housing and education, it may be stressed, are not essential solely upon humanitarian grounds. They are

equally needful on technical grounds. I need not labour this point, for the conditions conducing to labour efficiency are widely and thoroughly appreciated. I understand, indeed, that the Industrial Commission will devote special attention to labour problems.

I have alluded to foreign competition, and this is manifestly an exceedingly complicated problem, necessitating, for its full understanding, an investigation of cotton manufacture in all its phases. It is obviously impossible as yet to forecast either fiscal or transport conditions in the *post-bellum* period. The position therefore remains somewhat obscure. Two facts alone are certain. One is keener competition from Japan. The other is the steady growth of cotton manufacture in China. The former is fairly familiar. The potential competition of Chinese mills, on the other hand, is as yet only partially realised. Yet China is, in reality, for cotton manufacturing purposes, better circumstanced than Japan. This can be easily proved.

An American official agent, who recently investigated cotton trading and manufacturing conditions in China, supplies the following useful information. Cotton manufacturing in China in a modern sense, he says, is of comparatively recent development. Before the War with Japan the Chinese were beginning to erect spinning mills, but only in a half-hearted way. Prior to 1895 foreigners were not permitted to operate mills, but among the concessions wrung from broken and defeated China under the treaty of Shimonoseki, signed in 1895, was the right of foreigners to import machinery and to engage in manufacturing industries of all kinds in the treaty ports of the country. Immediately several of the foreign firms that were large importers of English piecegoods and Indian yarns took advantage of the provisions of the treaty and began the erection of spinning mills. Previous to this time there had been in operation six native-owned mills containing 183,000 spindles. By the

end of 1896 a number of foreign mills, with a total of about 400,000 spindles, were in operation in Shanghai.

The rapidity with which the industry developed is indicated by the statistics of the cotton yarn and piecegoods manufactured in local mills exported from Shanghai through the Maritime Customs. In 1896, 1,663,200 pounds of yarn and 134,626 pieces of grey sheetings, shirtings, and drills were shipped from Shanghai to other parts of China and foreign countries, as compared with only 198,993 pounds of yarn and 96,287 pieces of cloth in 1892. In 1899 the exports of cloth were not so large, but shipments of yarn increased to 28,250,666 pounds. These figures do not include exports through the Native Customs, nor is any account taken of the local consumption in Shanghai, figures for which are not available.

At first the mills mainly confined themselves to the manufacture of yarn, and the installation of looms was not undertaken very extensively until 1907 and 1908, following the large trade in piecegoods during and immediately following the Russo-Japanese War in 1905 and 1906. Several of the mills added looms to their equipment and undertook the manufacture of coarse sheetings and drills.

There is no organization among the Chinese and foreign cotton manufacturers, although the latter have recently formed among themselves a Cotton Millowners' Association. Estimates of the total number of spindles now in the country vary from 900,000 to 1,200,000. The total number of spindles has more than doubled in the past twenty years. The present war in Europe and the depressed state of trade has temporarily arrested the progress of the industry, but a return to normal conditions will doubtless give it new impetus.

The total consumption of cotton in all the Chinese mills when running on full time is estimated at 2,000,000 piculs (266,666,666 pounds) per year, or approximately 533,333

bales of 500 pounds each. The total yarn production, including that used by the mills for weaving, is 200,000,000 to 250,000,000 pounds annually, and the total cloth woven ranges from 40,000,000 to 50,000,000 yards, depending on the class of goods, market conditions, and the extent to which the mills are run on a full-time schedule. The principal yarns spun are 10s, 14s, 12s, 16s, and 20s. Some 32s are spun from American or Indian cotton, but only in limited quantities. The principal cloths woven are sheetings and drills. In the last two years one of the mills has taken up the manufacture of Canton flannels and the quality has proven so satisfactory that the production is increasing. The tendency among the mills is towards the production of a wider range of fabrics; small quantities of jeans, grey shirtings, towels, and other goods are beginning to be woven.

In the opinion of the American expert, the principal factors that have contributed to the establishment and growth of the Chinese cotton goods industry have been the following:—(1) A supply of native-grown cottons of sufficiently good quality for spinning low counts; (2) an enormous domestic demand for the production of the mills which, in the case of yarn, by far exceeds that of any other country in the world; (3) low cost of power, which is secured through a good supply of cheap coal from native mines and Japan, and in Shanghai, by the unusually low rate charged for electric power generated by the municipality; and (4) an abundance of very cheap labour, which makes the cost of production lower than in any other part of the world, and which is not subject to any legal restrictions as to hours of work or age of employees.

The cotton that is consumed in the mills is not as good in quality as American cotton, but it can be used economically for spinning the coarse counts, which are in greatest demand in China. Its low cost gives the mills a marked advantage in the production of heavy sheetings and drills, in which the

value of raw material constitutes a large percentage of the total cost.

China's imports of yarns and thread in 1913 amounted to 358,603,733 pounds, while India imported less than one-third of this quantity. The mills in China are therefore situated in a country where a large domestic market exists for their products at all times.

We are told that the profits of the Chinese mills are problematic, as they issue no yearly statements. In some years they pay well, in others they suffer losses and close down. With the exception of a few mills in Shanghai, none of the mills under Chinese management have run steadily, and several of them have ceased to operate at frequent intervals. It has often been demonstrated that the Chinese are unsuccessful in the executive management of industries. In most of the Chinese mills visited by the American expert, there were numerous "pensioners," friends or relatives of the owners or directors who did no active work but drew their pay regularly. This feature of their mills has seriously handicapped the Chinese and made it difficult for them to compete with those which, under foreign management, are operated more economically. Lack of co-operation, the wide prevalence of the graft, or "squeeze," system, ignorance of the technical details of cotton manufacturing, inability to secure capital, and the tendency to let plants deteriorate by not setting aside a sufficient amount of money each year for depreciation, are other factors which have restricted the successful establishment and progress of a purely Chinese cotton industry. The only Chinese mills free from these defects are those that employ foreign advisers or superintendents. It is evident that, concerning mill management, the Chinaman has much to learn.

On the other hand we are assured that the marked success of the well-managed foreign mills in Shanghai and the extent to which they have increased their productive capacity in the past few years are ample proof of the fact that China offers a splendid field for the development of cotton manufacturing. A supply of raw cotton and cheap labour free from all legal restrictions

as to hours of work or age of the employee, together with an exceptionally large home market as heretofore indicated, are the principal factors that augur well for the future of the industry. The low tariff on foreign imports of yarn and cloth constitutes an obstacle to more rapid expansion, but *post-bellum* changes will probably diminish this handicap. The success of the foreign mills and their large earnings in recent years will make it easy to procure ample capital, and it is the consensus of opinion among those who are engaged in the industry that the time will come in the near future when China will manufacture within her own borders the greater part of the coarser yarns and cloths consumed by her vast population.

China, therefore, promises to be another Japan. This is a portent of which Indian millowners would be wise to take heed.

H. M. Commercial Attaché at Yokohama reports that the increased export of sulphuric acid from Japan to Russia and China since the beginning of this year has led to steadily advancing prices of this commodity in Japan, and a considerably increased output. Several manufacturers of fertilisers have reduced their output and are devoting their energies to the production of sulphuric acid, while a number of companies have been established for the production of this chemical alone. It is estimated that the rate of production of sulphuric acid in Japan at present is some 582,500 tons per annum. Of this quantity about 421,000 tons are consumed by manufacturers in the production of sulphate of ammonia, hydro-chloric acid, etc., leaving some 160,000 tons available for general requirements in the country which are about 100,000 tons a year. Thus there are about 60,000 tons available for export. It is taken for granted that on the conclusion of the war the export trade will fall off, and it is also probable that there will be considerable decline in domestic requirements. It is estimated that the output of sulphuric acid in Japan if continued at the present rate of production, will be some 100,000 tons in excess of the demand on the resumption of normal conditions. We have been talking a lot in Mysore about the manufacture of sulphuric acid, but so far we have been unable to go beyond the talking stage.

THE ART OF ECONOMIC DEVELOPMENT.

BY "VIATOR."

THE latest number of the *Indian Journal of Economics* contains the first part of a most interesting and instructive article by the Editor, Professor Jevons, which is worthy of close study, not only by students of economics but by all who have a hand, however small, in shaping the destinies of a nation. The two are, unfortunately, by no means synonymous for the war has shown, in a dry light, how greatly some of those in high places would have profited by a course of elementary economics. The theme of Professor Jevons' article may be briefly summarised as the necessity for looking ahead in matters of economic development. Professor Jevons follows his own precepts and looks forward, not back. He does not therefore dwell, as he might have done, on what a different place England would have been, if, at the commencement of the Industrial Revolution, she had possessed statesmen who had even a faint conception of the principles he lays down. That is true of other countries, but of none to the same extent, for the countries whose industrial development began later than that of England, especially the United States and Germany, were able to profit by her mistakes. But even now, as Professor Jevons points out, the development that is everywhere proceeding apace in normal times, the enormous investment of capital, the revolution in the material environment of life, is undertaken with hardly any kind of guiding principle other than the business man's quest of profits or the State's desire to benefit the people. There is no definite conception of the objects aimed at, nor of any orderly sequence of work and measures such as might be designed to secure a maximum of advantage with a minimum of cost, at the

same time, distributing burden and advantage fairly between present and future generations. It is Professor Jevons' object to lay down the principles which should guide those who are responsible for the economic development of any tract of country. This he does clearly and concisely and much of what he says is applicable to any stage of development. The first step is to prepare a programme, (Professor Jevons adopts the hideous American spelling 'program'. If he prefers simplified spelling, why confine it to one word?) that is, to decide on the proper order of construction of the various works needed such as railways, roads, canals, etc., and their mutual relations to each other so that each may be of the greatest utility. The second step is to call in the Engineers and to determine the cost of the various proposed works, the rate of return which they promise and the time needed for their completion. At the third stage, the aid of the financier is invoked. It is his business to provide the ways and means, to investigate what funds may be available and to what extent borrowing can be resorted to. Professor Jevons proceeds to lay down the principles which should be followed throughout these three stages under five groups, of which, however, only three are dealt with in the present article. The first and second groups shade into each other, being mainly concerned with geographical principles. In the case of the first group, these are also demographic, that is, they concern mainly the close relation existing between the people inhabiting any territory and the geographical configuration of the latter. In the case of the second group, they are also economic and relate to the trade between different places and to transportation of commodities. The third group, which occupies by far the greater portion of the article under review, is that of the purely economic principles of consumption and distribution. The fourth group, which deals with finance and the fifth group which consists of the social and

legal principles involved are to be dealt with in subsequent articles.

The first group can be dealt with very briefly. In the old days, when geography was taught in schools very differently from what it is now and was not taught in colleges at all, this section would have seemed unnecessary but the important bearing of geographical considerations on any scheme of economic development would now be denied by no one. The first principle to be recognised is the extent to which the chief means of livelihood of the people is prescribed by the physical characters of the country they inhabit. Big manufacturing centres are not to be found in mountainous regions nor, as a general rule, are nomadic tribes or forests to be found in the valley bottoms.

Geography and economics are even more closely connected in Professor Jevons' second group of principles. Take, for instance, the question of material resources. There may be much waste land with a good soil, perfectly capable of profitable cultivation, if adequate communications and security of property could be established. There may be great stretches of land which would become fertile, if irrigated and for which it can be shown that water can be provided. Then again, all the old and famous trade routes were determined by geographical considerations. The old market centres obviously sprang up because they were convenient centres geographically. The natural trade routes should therefore be carefully studied in building new railways and the market towns should be utilized, as far as possible, as junction points on the railways or converging points of the important roads with the railways. Efforts should be made to turn the capital invested in the old land or water-carrying trade to profitable use and to prevent its becoming a serious competitor with the railway. This can be done by having new main roads converging from a distance on the proper points on the railway

so that existing vehicles and animals can find a profitable trade in feeding the railway with traffic instead of competing with it. This principle has, as Professor Jevons points out, been much neglected in India. Railways should, as a rule, follow existing trade routes instead of striking off across country. In Europe and North America, the through-lines of communications of both classes, the great trans-continental lines and the shorter but very important through-routes dictated by the situation of the great producing districts of the interior relatively to the most convenient and safe ports on the coast, are fairly well developed but not in India. Professor Jevons indulges in a most interesting forecast of what the location of the trans-continental through routes in India will be, judging from certain well-known geographical facts. The principal routes affecting this country will be the Trans-Asiatic line connecting South China and India directly with Europe by way of Karachi, the northern coast line of the Arabian Sea, Bagdad and Constantinople. It will enter India at Saidya in Upper Assam and will run almost straight across through Naini Junction near Allahabad, Gwalior and Luni to Hyderabad (Sind) and Karachi. Other lines which are sure to be constructed some day are a direct route from Moscow to Delhi through Kabul and Peshawar, one from Rawalpindi through or near Khogend to Omsk on the Trans-Siberian railway, one from Bengal through the Chamba Valley and Lhasa to Lake Baikal and Peking, connecting with another trans-continental line from Rangoon through Mandalay northwards and, finally, one from Calcutta through Dacca (by train ferry) and Rangoon to Singapore. The short voyage from Singapore to Port Darwin will be about the only break in a complete overland route from London to Australia. Professor Jevons' speculations open up a tremendous vista of possibilities.

India is somewhat better off as regards the second class of through-routes mentioned above, but even here, there are important gaps. Karachi needs broad gauge connection with Ahmedabad, and Colombo, the only one of the ports of the sub-continent which lies directly on one of the world's greatest high ways, with all parts of the Peninsula, south of Trichinopoly. We should have gone further than Professor Jevons here and have substituted Madras for Trichinopoly, for the latter is only the centre of a metre gauge system.

The principal trading centres in India are the great ports. There are only a very few others, such as Cawnpore, Ahmedabad and Amritsar. Professor Jevons holds that the stream of traffic from a distance of at least 150 miles in every direction should be directed primarily on such towns as these. He considers that this principle has often been neglected in India because the immediate interests of railway owners often apparently, or even really, conflicted with it. One cause, which has often modified the alignment of railways or made it completely different from what it would otherwise have been, has been fiscal barriers. Where the customs barrier exists as part of the main fiscal policy of the country, it is not likely that it will be modified with a view to developing any particular district. Professor Jevons points out that such barriers exist in India, as there are many Native States which impose import and export duties which, unless they are very moderate, tend to retard the development of trade. Octroi levied by large Municipalities may have the same effect. He suggests that much ingenuity might usefully be employed in devising a *quid pro quo* for the loss of revenue by the State or Municipality, so as to permit the construction of a railway which is estimated to pay after abolition or modification of the duties. We are inclined to think that he somewhat exaggerates the effect of the duties and doubt whether the construction of

any of the Indian railways has been affected in any appreciable degree by their existence. Lastly, under this head, strategic requirements are obviously a most potent factor in regard to the construction of railways. The war has shown that Germany has realised their importance to a greater degree than any other nation. Additions, if not modifications, can however always be made to assist commercial development.

This brings Professor Jevons to the most important part of his article, a study of the economic principles which should govern economic development. After emphasising the mutual dependence of industries and commercial agriculture, and the consequent necessity for good communications and organized markets, he draws attention to the bearing on the question of the laws of increasing and diminishing returns. Manufacturers, as is well-known, obey the law of increasing returns and therefore tend to develop with increasing success at particular centres where they have gained a start. In planning economic development, no rash attempt should be made to establish new centres of manufacturing industry. Some special conditions, such as to mention only one, very cheap power, should be present to justify the anticipation that a given point will be favourable to the development of a certain industry.

The principles which Professor Jevons next proceeds to lay down in regard to the construction of great public works are usually borne in mind in India now-a-day though some of them are occasionally overlooked. It has to be expected that during the first ten or twelve years, such works will pass through a lean period, during which the net receipts, after provision has been made for working expenses and maintenance, will fall short of the interest. The loss anticipated over the whole series of years must therefore be added to the capital cost and be taken into account in determining whether the net earnings will eventually be more than enough

to pay the interest on the total capital cost. If the period of waiting before the anticipated return can be expected to equal the interest charged extends over several years, the total loss of interest may amount to a sum which a Joint-stock Company or local body would be incapable of bearing, and it is, therefore, the duty of Government to undertake public works, the revenues of which are bound to take many years to mature.

The necessity for making a sufficient annual charge for repairs and depreciation is generally recognised but the loss of interest which arises from capital lying idle in partly finished works during the period of construction is a point which is often overlooked by the promoters of large enterprises, more often, Professor Jevons might have added, by Government than by private bodies. It may well be that a more expensive method of construction which would complete the works in a much shorter time would be cheaper in the end. Two classes of cases arise. In the first of these, only the capital expenditure sunk in the work in question is kept idle pending completion. An instance of this would be a long railway tunnel constructed so as to shorten the route or improve the gradient of a line already working. The second class includes cases in which delay in completing the work also involves equal delay in realizing income from capital expenditure on connected works already completed or capable of being speedily completed without extra cost for hastening the work. An example of this would be an irrigation canal system, where the building of the weir at the head works might take much longer than the construction of the canal, and its distributaries and increased expenditure to accelerate its completion might be justified. Professor Jevons gives interesting concrete examples to show how this principle would work out in practice and suggests that it is capable of expansion into a general theory of the correct timing of

every operation connected with the expenditure of money on engineering works.

Other considerations to which attention should be paid in planning projects for economic development are speed of transit and marginal productivity. In regard to the former, Professor Jevons points out that a railway system which takes a week to transport goods 200 miles will not develop industries to the same degree as if it were worked so as to take usually only twenty-four hours. Marginal productivity can best be explained by the illustration Professor Jevons gives, which is, again, that of an irrigation canal. The canal may have had its distributaries badly aligned and it may be shown that there would be economy both in the pay of the staff and in saving wastage of water by closing existing distributaries and making new ones. If this saving amounts to 10 per cent per annum on the additional capital required, that is the measure of the marginal productivity of capital in regard to the particular canal.

No one would dispute the next economic principle which Professor Jevons lays down, namely, that the State should reserve to itself the control of all public works and public utility services. Into the question whether it should itself own and work such services, Professor Jevons does not enter, but he holds that, in the interests of the country at large, every encouragement should be given to private enterprise under the control he indicates, and that the policy should be to reduce formalities to the minimum essential to control.

The last, and certainly not the least important, of the economic principles to which regard should be paid in carrying out a policy of economic development is the recurrence of fluctuations in the general level of prices of nearly all commodities at the same time as well as the tendency of wages to a continuous rise. This principle, as Professor Jevons says and says truly, is almost always overlooked in the consideration of

projects for public works. The files in any Public Works Department Secretariat in India would furnish striking evidence of this. It would be instructive to know the number of cases in which the commencement of big irrigation or other works has been delayed for a number of years and revised estimates have had to be submitted owing to increase in the cost of materials or of labour, especially of the latter, in the interim. This leads Professor Jevons into an extremely interesting examination of the course of prices and wages during the last century or so, a question on which his father before him was the greatest authority of his time. It is impossible to follow Professor Jevons in detail and we can only briefly state his conclusions which are that owing to the enormous creation of credit by belligerent countries and the continuation of other causes resulting from the war, it is probable that prices will continue to rise rapidly so long as the war endures. Possibly in Europe there may be a fall, or at any rate a halt, in the rise as soon as decisive military events bring peace negotiations within sight, but it is more probable that the price of metals, machinery and all constructional materials will continue to rise because the demand for these must remain enormous during the two or three years immediately following the conclusion of peace. When the trade boom due to the return of peace has worked itself out, there will commence a longish period of falling prices, lasting for twenty years or more and broken only by the usual cyclical fluctuations. When the reconstruction and contraction of credit and the reorganization introducing economies in production have worked out their full effect, it is probable that a secular rise in prices similar to that which began about 1896 will follow.

Professor Jevons thinks that the course of events in India will be slightly different, owing to the fact that the special conditions of the war have broken for the time being that close coincidence between Indian prices

and those of the world's markets which had gradually become established. Prices in India have risen less than in Europe and America so that, unless the parity of the rupee and the sovereign is altered, which is hardly likely, the re-establishment of unrestricted trade after the war and the gradual lowering of ocean freights must tend to raise prices in India. Prices in this country may, therefore, continue to rise or at least remain nearly stationary, for three or four years after the maximum following the conclusion of the war has been passed in Europe and America. It is thus not likely that there will be any substantial fall of prices in India earlier than 1923 or 1924, at which time a secular fall may perhaps begin.

The position in regard to wages is much simpler and Professor Jevons has little hesitation in saying that the probable continued rise in the cost of unskilled and semi-skilled labour is a factor of the greatest importance in projecting future public works in India.

As to the consideration which should be paid to forecasts such as these, it is obvious that blind postponement in the hope that prices will fall and labour become cheaper is merely folly. The policy which should be followed should be based upon a careful differentiation between works which require expenditure mainly on manufactured articles, especially such as are commonly imported, and works on which the expenditure is mainly for wages. As regards the former class, the tendency of policy in a time of high prices like the present will be for postponement; whilst in regard to the latter class, the chances are always in favour of delay meaning higher wages, rates and increased cost. The continuance during the war of construction work on the buildings of the new Capital at Delhi is, therefore, in Professor Jevons' view, amply justified on the latter ground as well as for the object of keeping the staff of skilled workmen together.

The relevance of the remainder of Professor Jevons' present article, in which he defines social, psychic and other incomes, to the art of economic development is not clearly brought out. It would, in our opinion, have been better left to the next article of the series which will, amongst other things, treat of the financial principles which should govern economic development. There, doubtless, it would be found to fall into its proper place in the scheme. We would only remark that, in talking of "psychic" income, Professor Jevons would seem to be straying from the realm of economics to that of metaphysics, though he would doubtless defend himself by pointing out that there can be no economic development on proper lines unless it aims at an increase in the total enjoyment of life by the community.

We shall await the concluding articles of the series with very great interest. As we said at the outset, British Statesmen missed a great opportunity at the commencement of the Industrial Revolution. That opportunity will not recur again in the United Kingdom but there is still plenty of scope for the application of Professor Jevons' principles in India and, if Mesopotamia is retained by the Empire after the war, that country will present a very much wider field in which to put them into practice. It will be nothing short of a disaster if its development does not proceed on the sound and rational principles laid down by Professor Jevons.

The exports of manganese ore from Brazil are advancing rapidly owing to the stoppage of exports from Russia, and the interruption of shipments from India to the United States, Russia and India having been hitherto the world's chief sources of manganese ore supplies. Brazil's exports go mainly to the United States and were 503,120 tons in 1916, as compared with 288,671 tons in 1915, and 183,630 tons in 1914.

SETTLEMENT OF MAHRATTA KUNBIES IN THE SAGAR GHATS.

BY M. VENKATANARASAPPA, B.A.,
Mysore Forest Service.

IN 1907-08 the Government of His Highness the Maharaja of Mysore were pleased to sanction at the instance of the then Conservator of Forests Mr. Muthanna a scheme for the revival of Kumri cultivation on a limited scale with the object of repopulating the deserted villages in the Ghat regions of the Sagar and Nagar Taluks with Mahratta Kunbies—a nomadic tribe which is found inhabiting the Ghat regions of the North and South Canara Districts and which was the only class that could be persuaded to settle in these regions. All previous attempts to induce the Kunbies to settle in these localities with due safeguards to minimize the evils and loss of forest wealth resulting from the wasteful Kumri cultivation (a method of shifting cultivation of dry crops like *ragi* and *save* by cutting and burning dense jungle and cultivating in the area; then abandoning it and proceeding to operate similarly on fresh area and so on) having failed, the scheme of gradually weaning them away from their favourite but pernicious mode of cultivation and inducing them to take to regular cultivation was proposed to be tried. As any attempt to rigidly prohibit Kumri all at once was calculated to scare away the Kunbies, it was proposed that each Kunbi settler be allowed one acre of land for Kumri every third year on condition that he should take up at the same time a minimum of three acres of paddy land to be held rent-free for three years, the object being to make the limited Kumri cultivation to serve as an inducement to the cultivation of large areas of assessed waste lands in these tracts and to enable the Kunbies to realize the benefits of a more permanent form of cultivation. The settlement of

fifty well selected cultivators was ordered to be tried in the first instance as an experimental measure; and to enable the Kunbi to provide himself with the requisite agricultural stock to settle down as a regular cultivator, a pair of bulls and five rupees worth of seed-grain were also permitted to be supplied free to each settler.

As it was found that the results of the experiment were encouraging and that these inveterate Kumri cultivators were taking kindly to regular cultivation, the following further concessions were sanctioned in G. O. Nos. R. 3244-7/ Ft. 129-10-12 dated 11-12-1912, and R. 6024-6 Ft. 19-13-4 dated 5-2-1914, with a view to enable the expansion of the scheme; and a Forester was deputed solely to look after the settlement work:—

- (a) A money-grant not exceeding Rs. 20 according to the discretion of the Forest Sub-Divisional Officer, Sagar, for the maintenance of each new indigent family settling down, during the first year;
- (b) A sum not exceeding Rs. 10 as may be fixed by the same Officer, for each family to meet the actual expenses of journey from their old abodes to the new;
- (c) Grant of two acres of land for Kumri cultivation instead of one acre fixed in the Government Order of 7th February, 1908;
- (d) The increase of the period, during which lands granted to the new settlers may be held rent-free, from three to five years; and
- (e) The extension of the scope of the scheme to other indigent persons willing to take up lands.

The above enlarged concessions having resulted in a large increase of Kunbi settlers during 1913-14, and the results thus far attained in attracting population to these sparsely inhabited parts of the *malnad* and

in persuading the settlers to give up their nomadic and wasteful habits and mode of cultivation altogether and to get absorbed into the permanent population of the tract, having been satisfactory, Government in their Order No. R. 11,925—9 Ft. 64-14-8 dated 24-6-1915 sanctioned the continuation of the scheme for a period of two years from July, 1915, at an annual cost of Rs. 5,000, and ordered the following enhanced concessions to ensure the stability and growth of the Kunbi colonies by reinforcing a steady flow of immigrants of the same class or community as the settlers :—

- (i) Increase of grant for seed-grain from Rs. 5 to 10.
- (ii) Increase of grant to each family for the purchase of a pair of buffaloes from Rs. 50 to 60.
- (iii) Grant of a loan not exceeding Rs. 30 to each family subject to recovery in easy instalments to enable the family to discharge existing debts, etc. Government have in their order No. R. 11,443 Ft. 79-16-5 dated 19th May, 1917, been pleased to sanction the continuance of the scheme for a further period at an annual cost of Rs. 5,000.

A statement showing the progress made in the scheme from its inception up to the end of June, 1917, is enclosed. As will be seen therefrom 246 families with a population of 1,193 souls consisting of 382 men, 391 women and 229 male and 191 female children have settled, in twenty-six colonies in the Sagar and Nagar Ghats. An area of 867 acres and 29 guntas of wet land assessed at Rs. 1,822-12-0 has been brought under cultivation, the total Kumried area being 678 acres and the expenditure incurred on the scheme from the commencement up to the end of June last being Rs. 25,374-4-6 for 269 families out of which twenty-three have from time to time been eliminated by the death of their headmen and various other causes.

Fifty-eight families were paying a regular *kandayam* of Rs. 491-12-0 at the end of June last on account of 204 acres and 18 guntas of wet land, their terms of free tenure having expired. The total assessment paid by the Kunbies since 1911-12 was Rs. 978-5-0 for wet lands and Rs. 540-8-0 for Kumried areas. The settlers are taking to the cultivation of sugar-cane and industrial crops in addition to the ordinary crops such as paddy, *ragi*, etc. Unlike their kinsmen in their old abodes beyond the State, our Kunbi settlers are now enjoying a settled and independent life which is rendered all the more happy by the fact that every care is taken to keep them out of the clutches of money-lenders, which by itself is a blessing denied to them in their former mode of living. On the whole the scheme is, thanks to the generosity of our benign Government, on a fair way to success, and the Kunbies who, prior to the introduction of the scheme were leading a nomadic and uncivilized life, eking out a scant livelihood partly by shifting cultivation and partly by working as *Jeethagars* in virtual bondage under money-lenders and feeding on palm-flour, bulbs, tubers and other irregular and unhealthy diet without systematic occupation and industry to keep them healthy, have now settled as permanent agriculturists in the once flourishing but now depopulated Ghat regions of the Sagar and Nagar Taluks. The following indications of growing prosperity are conspicuously discernible amongst our settlers as compared with the Kunbies residing in their old abodes in North and South Canara.

- (a) Nine families of old settlers have been in a position to take up, on *darakhast*, in addition to the lands originally assigned to them under concessions, 40 acres and 10 guntas of wet land assessed at Rs. 108 at the full rates of assessment.
- (b) About one-quarter of the total number of settled families have been

- able to increase their agricultural stock by purchasing out of their savings plough and milch cattle.
- (c) The majority of the settlers have taken to brass and copper vessels for their household and cooking purposes in place of crude earthenware vessels they were used to formerly.
 - (d) Our settlers present a very much more civilized appearance both in dress, behaviour and manners than those still continuing in their old homes.
 - (e) Their neat and tidy though thatched houses built invariably with sufficient air-space are maintained scrupulously clean with their presincts cowdung-plastered and with flower-gardens in front containing roses, chrysanthemums, gold mohur, bougainvillea, crotons, tulasi, plantain and other ornamental and useful plants, present a civilized aspect very uncommon in the interior of the *malnad*.
 - (f) They frequently visit the weekly shandies as well as *jatras* at Sagar, Talaguppa, Menasagar, Karur, Gersoppa and Bhatkal, and besides purchasing their domestic requirements, sell various articles made of cane such as baskets, boxes, plates and cradles, as well as rough mats made by their women out of palmleaves, and thereby add to their means of living.

It is, however, learnt that in view of the annual efflux of the Kunbi population from the South Canara District, whence the majority of our earlier settlers were got, the local authorities of that District have, in recent years, been affording increased facilities, in tracts adjoining the Mysore frontier, for Kumri cultivation to which the Kunbies are proverbially partial and which seems to appeal to them more than any other concession.

Kumri Cultivation:—In view of the enormous loss of forest-wealth involved by this pernicious but favourite mode of cultivation of the Kunbies, every care is being taken to minimize the area brought under Kumri; and although the prescribed limit

of fresh Kumri area is being given to the new settlers with a view to encourage and attract them, the old settlers are being persuaded to take more and more to regular cultivation in preference to this method. Added to this, the fact that they are bound down to wet lands and have of necessity to possess Kumri lands in close proximity to their paddy fields so that both the crops could conveniently be protected against the depredations of wild animals precludes them from operating on valuable virgin forests at long distances from their hamlets and makes them to confine their dry crops like *ragi* and *save* to areas already kumried, once near their hamlets and sometimes even to rest content with wet cultivation only. This will be clear from the fact that out of a total number of 246 families, only 119 families were cultivating 90 to 95 acres of Kumri land during 1915-16 and 1916-17. Arrangements are being made to assign for each colony a definite area of old kumried areas in the immediate vicinity of their wet lands, and to make them grow their dry crops thereon on a rotation of ten years at the rate of one acre per family every year, so as to avoid their operating on fresh wooded areas for the purpose. This is also calculated to improve the sanitation of the colonies by the provision of a cleared zone surrounding each hamlet. The Kunbies are also being persuaded to plant teak, white cedar and other valuable plants in deserted kumried areas. Since the commencement of the scheme in 1907-08, a total area of 678 acres has been kumried, Rs. 540-8-0 having been paid as *kandayam* on this account.

Educational Facilities:—With a view to provide facilities for the education of the settlers, five schools were started departmentally in the first instance at Iduvani, Talakalale, Nagavalli, Hanagere and Ikkebeelu colonies during 1914-15 and were managed by Forest Guards. In July, 1915, the first three were brought under the control of the Education Department, a schoolmaster on Rs. 15 being given for each, and the last two are still continuing in charge of Forest Guards who attend to the work of teaching the boys in addition to their legitimate work. The Education Department has been moved to give school-masters for these two schools also; and gradually more schools will have to be opened in all central localities. Till very recently only boys were

attending the schools, but during 1916-17, 22 girls joined the schools as a result of the persuasive efforts of the local Forest Officers. Under the existing circumstances, it seems unnecessary to open separate schools for girls in view of the fact that, first it would not be practicable for girls from several colonies situated at long distances apart and scattered throughout the Ghats to attend such schools started at one or two central localities, and secondly that it would not be worth while at the present stage to open a separate school for girls in each important colony till an appreciable number of girls could be persuaded to attend the schools.

In the Talakalale colony a night school for adults was started during 1916-17, and fifteen Kunbi men were attending the same and learning the three R's. Arrangements are

being made to open similar schools at all the five aforesaid colonies. A grant of Rs. 3 is being made to open similar schools at all five aforesaid colonies. A grant of Rs. 3 is being given by the Education Department to the school-master for the additional work of teaching in the night school.

The chief drawback in working the existing schools and opening new ones is the want of suitable buildings, which operates as a great hardship in the rainy weather. At present the schools are being held in temples and *katcha* sheds belonging to patels and head-men. It is very necessary to provide tolerably good buildings with Mangalore tiled roofing for the five existing schools at a cost of five to six hundred rupees each, exclusive of the value of timber which may be given free by the Forest Department.

The subjoined statement shows the particulars of the boys and girls of the several communities on the rolls of the five existing schools as well as the standards of the classes held :—

Name of colony	Classes held	No. on the Rolls									
		Kunbies		Haviks		Halepaiks		Jains		Total	
		Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Iduvani ...	A. B. 1st & 2nd.	7	1	10	1	4	1	1	1	22	4
Talakalale ...	A & B. ...	14	9	...	...	...	...	3	1	17	10
Nagavalli ...	A B & Ist. ...	10	...	12	...	...	...	...	...	22	...
Hanagere ...	A class ...	8	3	6	...	2	...	2	...	18	3
Ikkebeelu ...	do. ...	16	5	2	...	...	...	...	...	18	5
Total ...		55	18	30	1	6	1	6	2	97	22

It is seen from the above statement that a fairly large number of boys and girls of other communities residing in the interior Ghat villages of the Sagar Taluk are also benefitted from the schools started for the benefit of the Kunbies.

*Training in Vocational Industries :—*In view of the fact that the cultivation, which was the only means of the Kunbi keeping the wolf from his door, would not enable him to lay by anything against a rainy day, and with the object of enabling him to improve his income by pursuing some useful handicraft as a side concern in his leisure hours, it was arranged in 1914-15, at the instance of Mr. M. G. Rama Rao, the present Conservator of Forests (then District Forest Officer, Shimoga) to train the settlers in the rattan industry which suits their natural aptitude and environments. The

District Economic Committee, Shimoga, was kind enough to spare the services of a rattan instructor for the purpose from March to June, 1915, and again from January to end of June, 1916; and six Kunbi boys of the Hanagere colony made fairly good progress in the industry during this period, and are now in a position to prepare several useful articles of furniture, plates, boxes and wickerware, though they have yet to learn the mode of curing rattan after collection and giving the finished articles a fine polish. As the settlers will be considerably benefitted by giving them a sound training in rattan work and carpentry, which would form the most suitable industries under the conditions obtaining in the localities, it is very necessary to place the services of efficient rattan and carpentry instructors at the disposal of the Department for the next three to five years

during which period an appreciable number of these settlers may be expected to acquire a fairly good knowledge of the industries. These instructors may move from colony to colony and train up a large number of the settlers. At present the villagers in the Bharangi and Karur Hoblies depend for even the simplest carpentry on coolies who come from North and South Canara Districts. The Kunbies, if trained in carpentry, will facilitate the supply of labour and the construction of suitable dwelling houses in the interior villages besides building decent houses for themselves in place of the existing thatched sheds.

Provision of Drinking-water Wells:—With a view to provide healthy drinking water, the sinking of four draw-wells near the Kunbi colonies at Hanagere, Bankanbeelu, Hilkal and Hasarbyle, was sanctioned during 1915-16, by the Deputy Commissioner and President, District Board, Shimoga, under the Rural Water-Supply scheme. Of these, one well at Hanagere was commenced during 1915-16, and completed in 1916-17 at a total cost of Rs. 582-3-0; while the sinking and revetment of the other three wells was taken up and completed during 1916-17, at a cost of Rs. 997 with the exception of the parapet wall and framework for draw-pully.

Kunbi Temple:—With a view to provide a place of *Jatra* and worship for the settlers, the construction of a small temple at a cost of Rs. 50 was sanctioned out of the Muzarai funds. The work was completed in 1916-17, the kunbies contributing in this connection labour and materials valued at Rs. 60 and thereby increasing the dimensions of the building.

Co-operative Society:—With a view to infuse a spirit of co-operation amongst the settlers and to protect them permanently from money-lenders by facilitating the grant of loans at reasonably low rates of interest, an unlimited Co-operative Society comprising of 174 members was started in September 1915, 350 shares of Rupee one each being taken up by them. At the end of June, 1917, there were 177 members who held 576 shares. The total receipts were:—

	Rs.	a.	p.
On account of admission fees ...	44	12	0
Do. share amount ...	576	0	0
Repayment of loan instalments ...	58	0	0
Do. interest on loans at 6 per cent. 1	3	7	
Total receipts:	679	15	7

The total disbursements were:—

	Rs.	a.	p.
Loans given to 28 members ...	623	0	0
Contingent expenditure ...	33	12	0
Share amount returned ...	5	4	0
Total ...	662	0	0
Balance on hand ...	17	15	7

Considering that the prevailing rate of interest charged by the money-lenders of the interior villages and of Gersoppa ranges from 18 to 24 per cent, the grant of loans at such a low rate as 6 per cent is of incalculable benefit to the settlers and is being highly appreciated by them. As a result, some of the members who had in the first instance taken only one or two shares each, are gradually applying for more shares and more members are joining the society.

Medical Aid:—Proposals for the establishment of two dispensaries at Aralgod and Karue, which form two convenient centres for all the twenty-six Kunbi colonies, were submitted in August, 1916, and the District Board, Shimoga, has recommended the opening of a dispensary at Aralgod and has already posted a midwife at that place as a preliminary step. It is necessary to start another at Nagavalli or Karur, after providing suitable buildings for the purpose.

Communications:—Government in their order dated 29th November, 1916, referred the proposal of the Department to open a road from the neighbourhood of Talaguppa towards the interior passing through the Kunbi colonies, to the Deputy Commissioner, Shimoga, for necessary action. The Public Works Department is now constructing out of the Malnad Improvement Funds a road from Talaguppe to Jog passing through Mysore territory; and the opening of a branch road about two miles long from this will open out the Iduvani and Hanjalgod Kunbi colonies and will suffice for the present to the east of the Sharavati River. To the west of that river, the continuation of the Ghat road which has been constructed more than twelve years ago from Aralgod to Malakki (six miles) on to Bankanbeelu and Henni a distance of about nine miles, is urgently called for and will open out four important colonies. The completion of the Aralgod-Kogar-Bhatkal road coupled with the opening of branch roads of short lengths, will open out about ten more colonies to the west of the Sharavati River.

Statement showing the details of Settlers and the loans given over to them for Wet the Sagar and Nagar Ghats, Shimoga District, under the Scheme sanctioned in

Year.	Taluk.	Hobli.	Settlers.												Area of wet lands given over free of assessment for 5 years.			
			Kunbies.				Other indigent Classes.				Total No. of Settlers.							
			No. of Settlers	M.	F.	C.	No. of Families.	Males.	Females.	Childrens.	No. of Families.	Males.	Females.	Childrens.				
															Acres.	Guntas.	Assessment. Rs. a. p.	
1907-08	Sagar	Karur	16	36	34	68	...	...	...	...	16	36	34	68	51	27	135	4...
1908-09	"	Do.	6	10	4	16	...	...	...	...	6	10	4	16	24	5	64	8...
1909-10	"	Bharangi	24	44	33	43	...	...	...	...	24	44	33	43	69	10	158	...
1910-11	"	Do.	18	31	23	12	...	...	...	...	18	31	23	12	71	22	126	...
1911-12	"	Do.	28	47	45	48	...	...	...	...	28	47	45	48	103	3	216	12...
1912-13	"	Do.	24	35	30	27	3	4	3	6	27	39	33	33	80	4	179	8...
	"	Karur	5	9	5	6	...	...	...	...	5	9	5	6	16	31	50	12...
	Nagar	Lakshumpur	2	8	5	6	...	...	...	...	2	8	5	6	5	35	14	...
1913-14	Sagar	Karur	2	3	3	...	...	...	...	...	2	3	3	...	6	3	16	...
	"	Bharangi	36	50	48	37	44	67	58	47	80	117	106	84	252	3	457	8...
1914-15	"	Karur	3	6	4	7	...	...	...	...	3	6	4	7	7	19	18	...
	"	Bharangi	7	7	10	8	3	4	3	1	10	11	13	9	37	...	72	8...
1915-16	"	Do.	23	27	34	23	2	2	3	1	25	29	37	24	79	...	147	12...
	"	Karur	2	6	4	3	...	...	...	...	2	6	4	3	4	10	14	...
Struck off from the roll for the (Kunbi) families were elimi- nated by the death of head- man and others.			196	319	282	304	52	77	67	55	248	396	349	359	808	12	1,670	8...
			11	16	...	...	12	23	20	15	23	39	...	...	46	3	89	8...
Excess found in census figure taken by Forest Department.			...	...	+37	+37	...	...	...	...	...	...	+17	+22	...	...	...	...
At the close of the year 1915-16			185	303	319	341	40	54	47	40	225	357	366	381	762	9	1,581	...
1916-17 Bhavangi ...			18	23	25	10	3	6	6	9	21	29	31	19	65	10	133	12...
			203	326	344	351	43	60	53	49	246	386	397	400	827	19	1,714	12...

and Kumari Cultivation expenditure, incurred from 1907-08 to the end of June 1917, in Government Proceedings No. R. 4661-6/ Ft. 131-06-6, dated 7th February, 1908.

Area of culturable land under the usual Kandayam tenure in addition to land given free of assessment for 5 years.				Total area under wet cultivation.				Area Kumari Acres.	Sanctioned Allotment.			Expenditure incurred.			Kandayam paid for wet lands.			Acres and Guntas.	
Acres.	Guntas.	Rs.	a. p.	Acres.	Guntas.	Rs.	a. p.		Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.		
...	...	...	...	51	27	135	4...	13 1	...	...	...	217	4...	...	...	...	...	...	...
...	...	...	...	24	5	64	8...	...	...	...	...	757	12...	...	...	...	...	...	...
...	...	...	...	69	10	158	...	19 0	...	...	...	816	7 11	...	...	...	...	...	...
...	...	...	...	...	...	...	...	18 0	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	71	22	126	...	Karur H.	...	...	...	1,757	10...	...	...	...	...	...	...
1	35	3	8...	104	38	220	4...	51 0	...	...	...	2,029	10...	...	53	13...	32	27	...
...	...	...	...	...	...	...	...	18 0	...	...	...	...	...	...	3	8...	1	35	...
...	...	...	...	80	4	179	8...	Karur H.	...	...	...	2,986	10 3	...	64	8...	21	30	...
19	35	61	...	36	26	111	12...	70 0	...	...	...	...	...	...	...	...	Extra loans.	...	...
...	...	...	...	5	35	14	...	23 0	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	2 0	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	6	3	16	...	22 0	...	...	...	5,000	...	...	82	...	32	27	...
...	35	1	4...	252	38	458	12...	125 0	...	...	...	...	...	...	65	12	22	25	...
...	...	...	...	...	...	...	...	1 0	...	...	...	...	...	...	...	...	Extra.	...	...
...	...	...	...	...	...	...	...	Lakshumpur.	...	...	...	...	...	...	...	...	...	...	...
8	10	18	...	15	29	36	...	25 0	...	...	...	3,544	...	...	133	4...	51	16	...
...	...	...	...	37	...	72	8...	107 0	...	...	...	1,661	4...	...	83	12...	30	35	...
...	...	...	...	79	...	147	12...	80 0	...	...	...	...	...	...	277	4...	107	29	...
...	...	...	...	...	...	...	...	10 0	...	...	...	3,200	10 4	...	108	...	40	10	...
9	15	24	4...	13	25	38	4...	2 0	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	Lakshumpur.	...	...	...	...	...	...	...	...	...	...	...
40	10	108	...	848	22	1,778	8...	586 1	...	...	...	21,971	4 6	...	...	...	...	...	...
...	...	...	...	46	3	89	8...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	10	108	...	802	19	1,689	...	586 1	...	...	...	21,971	4 6	...	871	13...	...	...	...
...	...	...	...	867	29	1,822	12...	92 0	...	...	...	3,403	...	...	978	5...	From 58 families who had completed their periods of free tenure.		
40	10	108	...	867	29	1,822	12...	678 1	...	...	...	25,374	4 6	...	978	5...			

LIFE INSURANCE IN INDIA.

BY "J. S. C."

ONE of the most interesting and valuable business publications issued by the authority of the Government of India is the annual volume of returns of Life Assurance Companies working in British India. The fourth issue of this important publication dealing with the returns for the calendar year 1916 was issued from the Government Central Press at Calcutta a few months back. The volume is not only instructive and informing to those who are connected in any way with the management of Life Assurance business in India or elsewhere, but is also likely to prove useful to a much wider circle. For, it cannot fail to be of great interest to the large number of persons who are either already insured with one of the companies doing business in India or are looking forward to effecting an insurance in the near future.

Life assurance plays a prominent part in the economic machinery of every civilised country and indications are not wanting at the present day to shew that life assurance business has already taken a firm root in the Indian soil and is sure of a luxuriant growth. It is very necessary that business in such an important and highly technical line connected with the economic welfare of the population should be wisely guided and controlled by the State in the interests of the public, and the step taken by the Government of India in passing the Indian Life Assurance Companies Act, 1912, and appointing a Government Actuary to submit annually a report on the working of the Act was a wise and beneficent measure which came none too soon. The duties of the Government Actuary require technical qualifications of a high degree in the holder of that appointment. He must be an authority in Actuarial science, which is a

highly specialised branch of Mathematical analysis and he must have an extensive knowledge and experience of the conditions of Indian life and rates of mortality. But the qualities in themselves are not sufficient. In order to be successful in the discharge of his delicate and difficult duties, he must possess certain other qualities. He must have genuine sympathy with struggling Indian companies which desire to do honest work, but are lacking in expert knowledge and guidance. He must have courage and decision in giving frank and definite advice regarding undertakings of doubtful moral soundness. Anyone who has gone through the four annual volumes published by Mr. Meikle since his assumption of office must admit that the Government of India have been fortunate in having secured his services as Government Actuary and that he possesses all the qualities necessary for his success in a most eminent degree.

The volume under notice is a considerable improvement over its predecessors. This improvement has been made possible chiefly by the passing of the amending Act XXIV of 1917, which permits the returns submitted by the companies under the Act of 1912, being published in an abbreviated form. Instead of the statements being given as a diffused and a voluminous statistical mass, they are now condensed and the result is a manageable volume of about 125 pages with a few preliminary statements. If as prescribed by the original Act, the returns had been printed in *extenso*, the result would have been a bulky *tome*, about five times the size. It must be stated, however, that no useful information has been omitted. On the other hand the summaries of all valuation returns since the passing of the Act and the fairly lengthy extracts from the triennial and quinquennial returns submitted since the previous year's issue are exceedingly valuable and interesting.

The returns deal chiefly with forty-three Indian companies and twenty-four

others, of which latter, seventeen are of British domicile, four are colonial, and two are constituted in Shanghai and one is American. The Indian companies are comparatively more affected by the depreciation in securities than the other companies, for in this country, Insurance companies hold a much higher percentage of their total assets in Government securities than such companies in other countries. But as the Government Actuary has so fully and clearly explained, the effect of depreciation on Life Insurance Companies is not so serious as many may imagine. The depreciation in securities is accompanied by a considerable rise in the rate of interest, and Mr. Meikle calculates that in many cases, the depreciation might possibly make no material difference to the companies' financial position, owing to the higher rate of interest which may be taken for purposes of actuarial valuation.

It is a melancholy but instructive fact that since the passing of the Life Act, seventeen Life Assurance Companies in different parts of India have had to go into liquidation. Bengal, Bombay and the Punjab figure prominently as the homes of these unfortunate companies. Their going into liquidation was rendered necessary in the majority of cases by financial difficulties brought about by the insurance business having been transacted on the dividing society principle. This fact should serve as a warning to those who take policies in so-called Life Assurance Companies of obscure origin and management on the strength of tempting advertisements without making proper enquiries.

It is interesting to note that of the Indian companies now working, seven were established forty years ago and seven since the Indian Life Assurance Companies Act was passed in March, 1912. The great majority of the others were established in the six years immediately preceding the passing of the Act. It is curious that Mysore is so near both to the earliest and the latest of Indian

Life Insurance Companies, the former being the Madras Equitable Company established in 1829 and the latter the All India and Burma Company with headquarters at Bangalore established in 1915.

Owing no doubt, to the increased economic and financial disturbance caused by the continuance of the war, the sums assured by Indian companies under ordinary life assurance policies during 1916, shew a considerable decrease when compared to the figures of the two previous years, the figures for the three years ending 1916 being $3\frac{1}{4}$, $2\frac{1}{4}$ and $1\frac{3}{4}$ crores respectively. These sums do not include the figures of non-Indian companies doing business in India.

The average rate of annual premium payable under the policies issued by Indian companies exceeds 5 per cent of the sum assured. The corresponding rate deduced from the returns to the British Board of Trade is about 1 per cent lower. The difference between these two rates is largely due to the fact that endowment assurances are very much more popular in India than in the United Kingdom.

The total income of Indian companies in 1916 was 137 lakhs of which 21 lakhs or 15.4 per cent was utilised for working expenses. The assets of the Indian companies at the end of 1916 aggregated 736 lakhs of which about 537 lakhs were held in Government securities and other gilt-edged debentures guaranteed by the Government of India.

Some of the Indian Companies do business other than life, such as fire, fidelity guarantee, sickness, marriage and capital redemption, but it is chiefly the non-Indian companies doing business in India that do these other classes of business. No Indian company undertakes marine insurance.

The note of the Government Actuary and the returns published by the Government of India appertain only to companies doing business in British India and registered under the British Indian Act. It

would be useful for purposes of reference if important statistical information relating to insurance work done by companies or other bodies in the Native States are also included in the publications of future years.

Besides, there is a number of funds connected with Indian Government services and of other institutions unconnected with Government such as the General Family Pension Fund, the Hindu Family Annuity Fund, the Bengal Christian Family Pension Fund, which have been granted complete exemption from compliance with the Indian Life Act and the Government Actuary's publication contains no particulars with regard to most of them. It is suggested that as far as possible important facts and figures relating to these also may be included in future issues of the publication so that instead of being a mere compilation satisfying the requirements of the Life Act, the publication may be a full and authoritative reference relating to all insurance activities in India.

Here, in Mysore, an important experiment in the Insurance line has been started by the State undertaking life insurance business for the general public. The amount of business done in the short time during which the Public branch of the Mysore State Life Insurance scheme has been in operation aggregates about 6½ lakhs. This must be regarded as satisfactory.

There is reason to believe that the State Insurance in Mysore is having the desired effect, namely, that of carrying the benefits of insurance to localities and social strata, which companies working independently of Government, have not reached under existing Indian conditions.

ECONOMICS IN THE WEST.

Indian Shipbuilding.

London, February 27, 1918.—It is with more than common interest that people interested in India here have read an apparently authoritative announcement that the Government intend to establish shipbuilding yards in India for constructing the mercantile tonnage that is now, and for years to come, will be direly needed. Having regard to the vast conveniences that India offers for shipbuilding it is remarkable that the step should have been so long delayed. It would have been easy in the early stages of the war to have strengthened the equipment and skilled *personnel* of the existing yards and prepared the way for a really substantial programme of construction on more ambitious lines than have been followed in modern times in India. There was the greater inducement to the authorities to follow this course because of the fine traditions of shipbuilding which are associated with India and notably with the Bombay Government Dockyard. I referred in a previous letter to what had been done there in the old "wooden walls of England" days, and need not go over the ground again. But I may pertinently recall in connection with this new enterprise that when the Napoleonic wars were in progress and our shipping was being ravaged by enemy cruisers the East India Company presented to the Home Government of the day three fine ships made in India to cope with the menace. These vessels subsequently did good service and like many other Indian teak built ships of the sailing era showed the world what magnificent resources India had both in men and material for ship construction. Now that attention is once more to be given to the industry we may confidently anticipate that Indian shipbuilding will regain its old prestige.

ECONOMIC EFFECTS OF THE WAR.

What are the economic effects of the war?

The question is being anxiously asked not only in this country but in every land throughout the world which has been drawn into the awful maelstrom of the conflict. As far as Great Britain is concerned a very interesting and on the whole re-assuring answer was given by Mr. Edgar Crammond in a lecture delivered at the Society of Arts on the 25th instant. Mr. Crammond, who is a distinguished authority on economics, gave in his paper an exhaustive review of the position as it exists to-day and showed with great clearness how the war had influenced our whole economic organization and mostly for the good. Some of the facts and figures which he adduced to support his conclusions were very striking. In spite of the immense drain upon our man power, he pointed out, the production of the country had not only been maintained but had actually increased. Alone amongst the belligerent countries, the United Kingdom had increased its production of food during the war. Our production of steel, which before the war was seven million tons in the year ending June 1917, had increased to ten million tons. Even our coal production has not greatly declined (the figures for 1917 were 247 million tons against 289 million tons in 1913) though we have withdrawn from the mines 282,500 men for military service. As to our foreign trade the statistics no doubt show that the balance has swung very heavily against us owing to the necessity of obtaining large supplies of munitions from abroad. But even here we may derive some measure of comfort since, as Mr. Crammond shows there are important "invisible imports and exports in the shape of payments for transport and marine insurance, which do not figure in the official returns." Mr. Crammond concluded his address with an expression of the belief that the same genius which had enabled us to accomplish without undue strain the immense task of organizing our life for war would enable us, when peace returns, to overcome the difficulties of

demobilization and successful to re-organise our industrial life.

THE HIDE TRADE.

Sir Henry Ledgard's paper on "the Indian Hide and Leather Trade," read before the Society of Arts on the 14th instant did not convey much information to those who have closely followed the course of India's trade in the past few years. But it was a valuable means of bringing home to the minds of people here the enormous value of this trade and the dangers that attend it from foreign exploitation in the future. On the latter point Sir Henry Ledgard was particularly strong. He stated that the Tanners' Federation in this country, who had expressed themselves able to handle four million hides in the third year after the war were under no delusion about the danger and intimated that if German firms were included in the buying arrangements in India and the trade in India firmly established in British hands they would not enlarge their yards and sink capital in order to tan Indian ox and cow-hides. A system of licensing for the trade was advocated as a means of countering German influence. But Sir Charles S. Bayley, who presided, hinted that it might be difficult to introduce such a system, though he at the same time was careful to say that the Government had done and would do everything in their power to eliminate enemy influence. An interesting fact mentioned by Sir Charles Bayley was that Indian tanned hides were now providing 60 per cent of the material required for army boots. It is probably in this development of the Indian tanning industry that we may look for the most effective means of protecting the hide trade from further unfair exploitation. Most assuredly there are few branches of industry which offer fairer prospects to Indian enterprise.

NITROGEN FROM THE AIR.

At different times we have heard a good deal about the successful manner in which

the Germans have obtained supplies of nitrogen from the air to take the place of the organic deposits formerly obtained from Chile which the blockade has deprived them of. That the British Government are fully alive to the vast possibilities of this new method of obtaining nitrogen was indicated the other day by a reply given by Sir L. Worthington Evans to a question put to him on the subject in the House of Commons. This official spokesman stated that owing to measures adopted in allied and neutral countries, considerable supplies are becoming increasingly available and that measures are being taken to create a regular supply in this country more especially with a view to saving tonnage. Atmospheric nitrogen is apparently now exclusively used by the Germans in the manufacture of their explosives. This, of course, is the use to which our own home produced supplies are put. After the war, as Sir L. Worthington Evans intimated, the artificially produced nitrogen will play an important part as an agricultural fertiliser. So, as has been shown in other instances, the war is not without its compensations.

INDUSTRIAL INDIA.

"Shall India be industrialised?" Rather late in the day to ask the question one would suppose. Nevertheless, it is put forward and seriously debated in a new periodical dealing with Indian affairs which has just been issued. The writer, Mr. Laurence Housman, apparently inclines to the view that it would be a great mistake for India to industrialise herself. He holds England up as an awful example" in the following passage:—

"What, exactly, has industrialism in the modern sense done for England? More than a hundred years ago England turned definitely from agriculture to manufacture; from that time on, the future welfare of the nation lay not in open field and country, but in mines, workshops and manufactories. As a consequence, England was enabled to maintain at home a much larger population

than agricultural industry on the old lines would have made possible. She was no longer, as regards the necessities of life, self-contained and self-supporting; she depended more and more on foreign markets and sea-borne commerce; and before long no dispute between nations could arise in any part of the world which did not concern her."

There is a good deal more of this, but the writer's argument is sufficiently clear. England is not a nation whose action in the matter of industrial enterprise is to be copied but rather one whose experience teaches the lesson that she has taken the wrong turning. Of course there is nothing particularly new in this belittling of Britain's industrial success. Did not Ruskin regard the railway as the invention of the devil? Even as regards India, Mr. Housman is not original as he is merely repeating the sentiments expressed so forcibly in Sir Rabindranath Tagore's works in favour of an India freed from the contaminating taint of Western industrial influence. Now I suppose ideally almost everyone will agree that England, India—any country in fact—is more beautiful and in some respects happier in its original undeveloped state. But that is not the real point. What we have to settle is not whether we may remain a rural wilderness producing nothing but what is raised by agricultural effort, and by simple village industries, but whether we will march in the van or bring up the rear acting as hewers of wood and drawers of water for more enterprising nations. If this war has taught any lesson, it is that no country, however remote from the West, can wrap itself in a mantle of exclusiveness and say to the outer world I will have nothing to do with your barbarism and your materialism. The only safe course for a nation or for groups of nations like those to be found in India is to make the best of the modern world taking from it what is good and rejecting what is evil or doubtful. Certainly at this time of day only a fanatical dreamer would if he could exclude from his environment the great conveniences of modern civilisation. An India to-day without railways would be a desolate place indeed. Probably even Mr. Housman would think they have their value if he were compelled to take a journey of a hundred miles or more in a hack gharri or a palankeen.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Combination Land and Water Vehicle.

Washington, D.C., U.S.A., 12th March, 1918.—Numerous attempts have been made to combine in one vehicle a hybrid type that would have the characteristics of either the automobile, when travelling on land, or a motor boat when used in the water. Naturally, any attempt to solve this problem involves a careful consideration of engineering principles that are not difficult to apply in the case of either vehicle if used singly, but which are exceedingly difficult to reconcile when the two are to be used in combination.

A recent attempt to solve this problem has produced interesting results. The vehicle may be used on land as a one-ton to two-ton capacity motor truck, capable of a speed of twenty-five miles per hour, and can also be used in the water owing to the air-tight construction of the body and motor compartment, where it will attain speeds of eight to ten miles per hour. It is believed that a vehicle of this character may have advantages for war use as well as for commerce generally, and can be employed by engineering and signal divisions of an army.

The common power plant is used for propulsion, both on land and in the water. When the vehicle is operating in the water the propeller placed at the front end of the car is shifted into gear by an ingenious hand-actuated clutch mechanism, so that it is rotated at the required speed. What is the rear end of the car on land becomes the bow of the boat in the water. The steering is accomplished by the same steering gear, as disks attached to the front wheels perform the functions of rudders on a boat. The newly-designed vehicle is provided with a chain drive, but it is stated that new models

to be produced are to be equipped with a completely enclosed shaft-gear drive system that will not be affected by water, inasmuch as the parts will revolve in oil-tight and water-proof housings. The arrangement of the axles and auxiliary parts is such that if the vehicle is to be used for any length of time in the water they can be removed and their impeding action or resistance be eliminated, which will tend to give the craft considerably more speed. The body is of steel, and while it cannot be shaped on the most approved streamline form on account of the projecting axle parts and operation of the suspension mechanism, at the same time it does not offer as much resistance as one would naturally suppose. Of course, when the axles are removed filler plates are supplied to improve the outline and reduce the resistance. The car is equipped with 50-horse power, four-cylinder engine of conventional construction. It has a three-speed and reverse selective change speed gear box of the usual form.

A NEW NON-GLARING HAND LAMP.

In a simple form of hand lamp operated on battery power a recent inventor appears to have solved the problem of producing a non-glaring searchlight. As a matter of fact his lamp is an exceptionally powerful projector of both spot and diffusive illumination. The concentrated beam of projected light extends over 500 feet, while the objects close at hand are illuminated by a diffusive glow of indirect and transmitted light, devoid of the annoying direct filament glare.

According to the inventor's views, the possibilities in glare reduction while still retaining light projection, lie in minimizing the glare due to direct visibility of the light source and in forming a main reflector of least absorption well concealed from the direct visibility.

This is carried out in practice after this manner: The light source itself is embraced to the angle of 105 degrees with a spherical curve corrected for absorption and, beyond

the aperture of the main reflector, there is an annulus of spherical curve whose geometrical focus is at an offset. Therefore the light coming from the filament into this annulus is not returned on itself but at a distance coinciding with that angle that the frontal screen intercepts. This frontal screen is translucent, and light coming from the filament accordingly partly illuminates it, while light coming from the annulus impinges on the outer surface of the screen. The screen becomes highly illuminated and is then a source of diffused illumination. Being slightly beyond the focal point of the main reflector it also acts as source of illumination in conjunction with the spherical reflector. The result is a highly efficient projected beam augmented by non-glare diffused illumination.

AUTOMOBILE IGNITION AND CARBURETION.

One great object sought by makers of ignition apparatus is to produce as large and as hot a spark as possible, in order that the ignition of the charge may be effected at the point in the stroke where the most effective result will be secured. This proposition is based on the very imperfect condition of the mixture that now prevails—that is a mixture consisting of the air and a small percentage of vaporized fuel that carries with it a large proportion of the fuel in the form of an unvaporized spray. If, instead of this, the entire charge of fuel was entirely in the form of a true gas, or vapor, the ignition would be so much easier to effect that a small, light, and inexpensive ignition apparatus would amply suffice instead of the powerful and costly devices that are now being sought. The most needed improvement in internal combustion motors to-day is in an entirely different direction, and that is a carburetor that will furnish the charge in the form of a true gas that can instantly be ignited and completely consumed. Such a carburetor would

increase the power of the engine, and at the same time consume much less fuel.

FURNISHING NITRATE TO THE FARMERS.

As a part of its program for stimulating agricultural production the federal government announces, through the Secretary of Agriculture, the purchase of about 200,000 tons of nitrate of soda which is to be sold to farmers at actual cost. The nitrate is intended to be used most largely by farmers in the Atlantic coast states from Long Island to Florida, owing to the value of nitrates for such crops as truck, grain and cotton, and the greater cost of freight to middle and western states. The free-on-board price at ports is to be \$75 a ton.

County agents and local committees are co-operating with the department of agriculture in the work of distributing the nitrate and will furnish farmers with application blanks and explanations of how to obtain the material. If the total of the applications exceeds the 200,000 tons available the government reserves the right to prorate the amount to individuals in smaller quantities.

None of the nitrate will be sold to dealers, either directly or indirectly, according to the department, and each farmer in his application must agree not to resell any nitrate, but to use it on his own farm. The government is making every effort to reach farmers who desire a part of this nitrate, but states that it will be impossible to visit every individual farmer, and urges all who desire to purchase nitrate to make application.

THE GREAT LOSS FROM RUSTING OF STEEL.

It is now quite universally admitted that the rusting of iron and steel is one of the most serious industrial problems of the day. If we assume an average life of steel to be (as has been estimated) thirty-three years the depreciation charge of 3 per cent represents, according to officials of the United States Bureau of

Mines, a yearly loss of one million tons of product in this country for the crude or semi-finished material alone, exclusive of correlated manufacturing costs. The inevitable rusting of steel may be justly claimed to be the mainstay of the zinc industry, as over 60 per cent of the metallic zinc used in the United States is for galvanized iron and steel articles, representing an annual outlay of \$20,000,000 in an endeavor to protect metals from decay. Enormous amounts of paints are used in a like endeavor. About, 5,000,000 tons of coal are needed in the production of steel to replace the annual waste, and more than 1,000,000 more tons for replacing the zinc that is annually lost. Absolutely no estimate can be made of the value of the brass, bronze, copper, aluminum, nickel, tin, and other metals and alloys used in machine parts, as sheathing, for plating, etc., to protect steel, or as a substitute for it in places where it would be used but for its lack of resistance to atmospheric attack.

THE COTTON PLANT AS A FOOD PLANT.

Raising a 500-pound bale of cotton means, in round figures, producing seed from which are obtainable by common methods of milling the following: 150 pounds of fat, 400 to 750 pounds of cotton meal, according to method of manufacture; 350 pounds to no cotton seed hulls, according to method of manufacture, and 50 to 100 pounds of short lint according to method of manufacture. In other words, the food and feed products of the plant largely exceed in total quantity the cotton. The average production of cotton seed per acre is 14 bushels, the same average number of bushels per acre as is grown of wheat. The fat (removable, edible fat) which accompanies a 15,000,000 bale cotton crop, as soon as the cotton is ginned and the seed milled, is the same as the fat which can be recovered from 15,000,000 enormous hogs requiring months of feeding and fattening on high priced grain.

The war-time feed for cotton mules, intended to save corn, which the animal

husbandmen have approved and which still lacks promulgation, is a mixture of 35 pounds of corn and cob meal, "ear corn grist," well ground and well mixed at the nearest possible place to the farm, if not on it, with 21 pounds of approximately 25 per cent protein meal either from cotton seed, velvet beans or peanuts, totalling 56 pounds per bushel of better and cheaper mule feed than a bushel of shelled corn, and making a clear saving of half a bushel of corn possible.

ORGANIZING SPENT STEAM.

Every town and city has a greater or less number of exhaust pipes discharging steam into the air—a waste from small industrial plants which might be stopped by a slight expenditure for pipe extension which would connect these hundreds, and sometimes thousands, of non-condensing engines to the heat system of adjoining properties, thus heating buildings with steam which is absolutely going to waste, permitting the shutting down of thousands of heating boilers, and the diversion of coal to power plants which urgently need it in the present crisis. What seems to be most favored is termed the isolated block central station for the cheapest, most economical and most convenient production of light, heat and power. This idea has been developed to some extent in the larger cities of America, but never on the extensive co-operative lines which the present status of the fuel question demands.

In proof that such a system would pay, there are cited the central steam-heating plants in many cities and suburbs, which generate steam for no other purpose than to supply heat to customers, not as a by-product, but as a commercial proposition, carrying a satisfactory profit. Besides the convenience of such a system to steam-using customers, and the more economical burning of fuel at central stations, with non-fluctuating supplies of heating steam day and night during winter, the isolated block plant

would make unnecessary the large investment in small boilers and furnaces for office buildings, stores, residences, schools, churches and the like.

CAN COAL BE PUMPED?

However much we as Americans pride ourselves upon knowing the last word in economy and efficiency, the fact remains that the exigencies of war are forcing us for the first time to "get right down to our knitting."

The ideal power for all purposes is electricity, generated by hydro-electric power plants. Next to this we can safely place the generation of electricity by steam plants located at the coal mines, with transmission lines to the point of consumption. After this the production of gas at the mines and its piping to the consumer. And, lastly, we have the production of power at the point of consumption from coal or oil transported from the mine or well to the distant power station.

The man who would suggest doing away with pipe lines for transporting oil would be deemed a poor economist or engineer. We know that pumping oil through pipes is vastly cheaper than any other method of transportation, and we may cite as a recent example the 170-mile line between the Coalinga coal field in California and tidewater at Martinez, on California Bay. This line has 11 pumping stations 15 miles apart, with one-third of each section of 10-inch steel pipe, and two-thirds of 8-inch steel pipe. The method used is the "hot oil process," the oil being heated to from 110 to 140°F. to make it more fluid, which method has been found to be the best for California oils of about 16° Baume gravity. The oil is forced through the pipes at 800 pounds pressure, by four-plunger pumps operated by compound engines, the steam being generated in oil-fired boilers, the deliveries being at the rate of about 25,000 barrels per day.

Elsewhere we find oil being pumped through pipes by the rifled process, where a thin film of water is injected between the oil and the rifled pipe to reduce friction, this method being exactly analagous to the pumping of powdered coal mixed with water. The two most economical methods of firing boilers are by the spraying of fuel oil into the fire box or of blooming in powdered coal, both methods being cheap in point of operating cost and high in heat units produced from a given amount of fuel.

Now the pumping of coal from the mines is engaging serious attention. There is an immense amount of slack coal, or "culm," produced annually and the cost of coal mining could be materially reduced, if no endeavour had to be made to produce lump and smaller sizes of marketable coal, by the pumping process.

ALFRED T. MARKS.

With the restrictions on the sale of milk and the higher prices of this commodity in consequence, a large field has been opened for the sale of milk powder; for this product takes the place of fresh and condensed milk in the household, and is extensively used in the manufacture of chocolate, biscuits, confectionery, etc., and for making various chemical and pharmaceutical preparations. In the East, where sheep and goat's milk is mostly used, fresh milk is generally obtainable in the spring and summer when it is abundant, while condensed milk is a luxury. A new machine therefore for making milk powder from full as well as from skim milk will be of much interest to many people in the East, as well as in this country, who in view of present circumstances may decide to take up such an interesting and promising industry. This new machine reduces the milk to powder by passing it between steam-heated rollers, and is capable of dealing with from 90 to 100 gallons of full milk, or from 135 to 145 gallons of slim milk per hour.

NOTES.

Take any British paper or journal and you will find nothing in it but a cry for increased organization on the part of the people to meet the present necessities. Nay more; to meet the difficulties of the future. The British Committee on Commercial and Industrial Policy after the War has given a definite lead in the matter. To judge from the British papers to hand by the last mail the call is being eloquently responded to in the press. The attention of the commercial folk and of the industrialists is being pointedly drawn to the need for greater organization among themselves. Organization by trades is recommended as the best in the present circumstances. What is meant by "organization by trades may be briefly explained here. It is that the brass founders' trade, the boot and shoe trades, or what not, should, it is said, form associations with the definite object of promoting trade abroad. This recommendation has been confirmed by the Balfour Committee. It is definitely stated that the Committee regards it as very desirable that in all important British industries there should exist strong, comprehensive, and well organized associations which should be clearing houses of information of common interest and should be competent to voice the opinions and needs of their respective trades as a whole. It is also suggested that Government should actively encourage and foster such combinations in the interests of foreign trade as against State-aided German enterprise in the same domain.

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Here is a lesson for us in this country. If the advice given to the British trades is sound, the policy underlying it, ought to be equally good for us. In any case, the need for organization in this country is much greater than anywhere else. Here every

body is a law unto himself. Trade and Commercial organizations are few and far between and the waste of talent and effort is something fearful. It is certain that with better organization, we could do much better. Even in the commonest trades, the old order has given way without anything more suitable taking its place. It would be in the best interests of the country if each trade and industry is tackled individually and its organization taken in hand, if need be with State aid, and something definite done for resuscitating it and making it to get a new start. That such a fresh start is necessary few who know the real conditions of the country will deny. The spirit to improve is there in the men forming the trades and the industries; it only wants the talents of organizers of the right type to weld them together into associations and guilds of a working or workable kind. The grand aim of all such organizations should be not to care merely for sectional interests but to assist in dovetailing the various related trades and interests in such a way as to make helpful to each other and thus make for increased prosperity all round. "From production to sale" must be the aim steadily kept in view. Every trade and industry must have for its motto, better organization for itself, better co-operation with allied trades and industries and better co-ordination of all activities for the more rapid growth of economic prosperity.

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The *Times of India* commends to the attention of the Finance Department the conditions accompanying the renewal of the charter of the Bank of France, which are summarised by its Paris correspondent. Amongst these conditions is the pledge of the bank to open twelve new branches in the next twelve years, as well as twenty-five subsidiary branches and special offices in fifty provincial towns. The bank further undertakes to act as a clearing house for local bills and local paper issues, with the

result that credit facilities will be made available in the most remote districts of France. What an object lesson for us in India! Here, it is true, the presidency banks have not that monopoly of the note issue, which is exceedingly lucrative to the Bank of France. On the other hand they have a monopoly of the custody of government funds, which directly and indirectly is very valuable. The goal we have to set ourselves is to bring credit facilities in the most remote districts of India. As a first step in that direction we have to lay down a policy which will establish banking facilities in every district head-quarters. That ought to be one of the duties thrown on the presidency banks in return for the valuable privileges which they enjoy—privileges whose value is attested by the appearance of their balance sheets. If it cannot be done through the presidency banks, then the establishment of a State bank should be regarded as of the greatest urgency. The figures given by Sir William Meyer showing the subscriptions to the War Loans made through the post offices are wonderfully illustrative of the change in the habits of the people of India, and it stands to reason that the post office, with the best desire in the world, must be less satisfactory than a bank for purposes of this character.

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With reference to the recent creation of the post of Director of Industries for a period of two years and the appointment of Mr. P. J. Mead, C.I.E., I.C.S., to hold it, the Government of Bombay have issued the following Press Note, dated the 18th March, 1918:—"The functions of Provincial Directors are still under the consideration of the Industrial Commission, who have taken much evidence on the point and will shortly submit their recommendation. Pending consideration of their views and the receipt of any orders which the Government of

India may pass on their report, the Governor-in-Council considers the following may be enunciated as the Directors' main functions:—The promotion of local industrial enterprises by (a) advice and information, (b) introduction of new methods and improved implements, (c) management of pioneer and demonstration factories in which new industries can be tried on a commercial scale and demonstrators, technical experts and managers can be trained, (d) examination of requests for loans and other concessions and suggestion of the form of assistance required. The Director will also study the economic conditions of the presidency from an industrial point of view, collect commercial information and investigate all existing industries which give promise of local development with a view of rendering them any assistance in his power." Expert and technical assistance will be afforded him as needs arise and opportunity offers and it is proposed to associate with him an advisory committee of which the Director will be chairman.

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The following is from the Annual Colonial Report for 1916 on Straits Settlements:—The articles which gave the largest increased values from the United Kingdom were cotton piece-goods, apparel, cigars and cigarettes, machinery, including electrical goods, coal, tin plates, iron nails, and telegraph and telephone materials. The articles showing declines in values from the United Kingdom were cement, corrugated iron, steel, motor cars and motor cycles, etc., malt liquors. From the United States of America increases in imports are seen in petroleum, rubber tyres, lubricating oil, motor cars, milk, leatherware, roofing and building materials, steel, tinned provisions including fruits, machinery; and decreases in cigars, cigarettes, nails, and cement. From Japan the following show advances in imports:—Coal, silk, piece-goods, matches, chemicals, fish dry and

salted, glass and glassware, apparel, etc., crockery and procelain, cabinet and woodenware, cycles parts and accessories, hardware, ironware and cooking utensils, while rubber tyres show a decline. The total increase of exports to the United Kingdom is accounted for by advances in such articles as tin, gambier, sago (black) and white pepper, tapioca, copra, jelutong rubber, para rubber, hides, preserved pines, India rubber, wolfram ore; but decreases took place in rattan, gutta percha, illipi nuts, coconut oil and isinglass. Exports to the United States advanced in values of gambier, tapioca, rattans, jelutong, gutta percha, para rubber, hides; but tin, sago (black) and white pepper, and India rubber, fell in values. Exports to Japan showed increases in values of Borneo rubber, shells, raw cotton, tin, para rubber, and phosphate of lime, while declines are seen in tinware, zincware and opium.

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A Bombay Government Press Note, dated the 13th March, 1918, states that Messrs. Turner Morrison and Co., Bombay, have applied to the Government for the grant of certain concessions for the organization of the bamboo paper pulp industry in the forests of the Kanara district. It is proposed that a syndicate under the management of the Company should conduct experiments regarding the possibilities of the manufacture of pulp-stuff from bamboos on a commercial basis. If the results of such experiments are satisfactory a public company will be formed in India to manufacture the pulp. The late Indigenous Industries Committee were of opinion that there are good prospects of establishing a profitable bamboo pulp industry in the Kanara forests, but that a considerable amount of preliminary investigation and experiment must be carried out before it would be possible to place before the public a satisfactory scheme for the investment of public money. These preliminary inquiries will cost a considerable sum, while their results will be of assistance to other companies operating in other parts of this presidency of India. The Government, therefore, consider it necessary to grant a measure of assistance to Messrs. Turner

Morrison and Co., in the initial stage of their scheme as well as in their subsequent operations. The Kanara district will accordingly be reserved as the scope of the syndicate's experimental operations for a period of two years, and during a period of seven years from the date of the formation of a public company no supplies of bamboos will be available from the Government forests in Kanara for the purpose of making bamboo pulp for anyone else than the proposed concessionaires.

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To meet the serious position caused by the shortage of butter the (British) Ministry of Food have been carrying out experiments in order to find suitable and economical ways of eking out the available butter and margarine supplies by mixing in other food substances, and so producing cheap and palatable substitutes. These experiments have shown that an excellent "potato butter," costing only about 5d. per lb. (or less if margarine is used) can easily be made in an household without special knowledge or apparatus, in accordance with the following recipe:—Peel the potatoes and boil (or steam) until they fall to pieces and become floury. Rub through a fine sieve into a large basin which has been previously warmed. To every 14 oz. of mashed potato and 2 oz. of butter or margarine and one teaspoonful of salt. Stir thoroughly with the back of a wooden spoon until the whole is quite smooth. The butter may then be made up into pounds or half-pounds and kept in a cool place. The potato butter may be improved in appearance by the addition of a few drops of butter colouring, and if it is to be kept for more than a few days a butter preservative, of which there are several forms on the market, should be used. The amount should be in accordance with the printed instructions on the packet for use in butter. Both the colouring and the preservative should be well mixed into the potato at the same time as the butter and salt. If these directions are carefully followed, potato butter will keep for a considerable time, though it may be found that the surface is apt to become dry, but this can be obviated by keeping it wrapped in grease-proof paper.

GLEANINGS.

Preparation for development works everywhere is the order of the day. The Austrian and Hungarian financial houses have been considering various enterprises in the Balkans. A few establishments—sugar factories in Serbia and Bulgaria, a mill in Sofia, and a petroleum concern in Roumania—have been organized, and other plans are being worked out. Austrian manufacturers have made arrangements for the installation of machinery and plant which, in the case of certain large works, will involve the expenditure, within a comparatively short time, of a very large amount. The solution of machine work for manual work, begun under the pressure of war, will persist in peace-time. In coal-mining this transformation is very conspicuous. Electrically-propelled conveyances are replacing cars drawn by horses; and aerial ropeways are becoming common. In the State coal mines, important mechanical plant has been installed. Similar transformations are reported by employers in other branches of industry; and from engineering shops it is announced that orders for cranes, lifts, etc., are so numerous that all of them cannot be executed. Agriculture alone, it is stated, is slow in adopting these new methods, for even now on quite large estates manual labour and horse-power are still used for driving threshing machines. But agriculturists are imbued with modern ideas.

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Returns recently published in Japan illustrate the growth of Japanese trade with India as a result of the war says the *Statesman*. The value of Japan's exports to India has increased during the past three years from £4,200,000 to rather over £10,000,000 while she now takes from India goods valued at £22,300,000 as compared with £14,700,000 three years ago. The total trade is thus valued at over £32,000,000—a very consider-

able item in India's war-time commerce and roughly the equivalent of the entire trade of both Germany and Austria-Hungary with India in 1913-14. Of India's exports to Japan the vast bulk, now and always, consists of raw cotton which accounted for all but £2,000,000 of Japan's entire imports from this country. To India Japan sends all classes of goods manufactured from Indian raw cotton—under every heading the growth has been very large of late, despite the increase of the Indian protective tax to 7½ per cent *ad valorem*—glass goods, beer, paper matches and a number of minor items. Under most headings the increase is steady and continuous, though how the declaration of peace would affect it is a little doubtful. The imports of Japanese matches and beer would certainly show a falling off, and it is probable that cotton goods and manufactured glass would do the same.

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The Glass Expert to Government, U. P., has recently built an open gas fire regenerative continuous tank furnace at the Allahabad Glass Works, Naini. The furnace has been working for over a month and is said to be very satisfactory, says the *Pioneer*. It possesses a great many advantages over the old type of direct fired furnaces. The capacity of the new furnace is much larger, it does not require as much labour and the smelting is done much more quickly. In the old type of furnace the expense arising out of the breakage of crucibles has always been great. In the tank furnace no crucibles are required at all. The consumption of coal is about 50 per cent less. It gives uniform glass and is in every respect a great improvement on the direct fired furnace. It is to be hoped that this furnace will inaugurate a new era in the glass industry of this country. The cost of the furnace is Rs. 40,000 and is capable of dealing with 150 maunds of raw material in 24 hours.

SPEECHES AND PRONOUNCEMENTS.

Training of the Coming Generation.

Lord Haldane writing in the *Eton Review* has some characteristic remarks on Democracy and the training of the coming generation. We take the following from the same :—

I am not sure that any political party in this country, and I do not except the Labour Party, has fully realized the vital meaning, for the capacity of the nation at large to govern itself, of the question of Education. After the age of fourteen, as was shown in a debate which took place in the House of Lords not long ago, only one in ten of our youth receive any further systematic education. The result of this is to maintain artificial class distinctions. For people are in the main paid and respected according to ability to direct, and this ability depends on intellectual capacity, which in normal cases is the result of training. In the factory, in the law courts, in medicine, in teaching, in commerce, in administration, in the fighting services, this is not only true, but is becoming more strikingly so as generation succeeds generation. And no change in the system of production and distribution is likely to make things otherwise. "On earth there is nothing great but Man; in Man there is nothing great but mind!"

We cannot make him equal in mental capacity, for nature fashions them unequally, but we can alter the arrangements under which the chances of a boy or girl to have the intelligence fully developed by education, depend on the accident of social surroundings. We ought to get rid of this uncertainty if we can. For the nation, in the rivalry that the world will witness when peace is restored, will require all the talent it can command. And there is a vast reservoir of youthful talent which to-day is not used. Real genius is, beyond question, often hidden there, undeveloped, and doomed to remain undeveloped for want of opportunity to produce the power of thought and action that is latent. And a much larger amount of talent short of genius, but yet of the utmost value, is also lying there unproduced.

Democracy ought, therefore, if for this reason alone, to insist on equality of educational opportunity. The way is not difficult. The coming continuation schools will make an increasing amount of valuable training compulsory up to the age of eighteen. This will be a great step forward, and it will mean still more if provision is made for selecting those whom the continuation schools reveal as of exceptional capacity and transferring them, by means of scholarships, to the narrower and steeper way which leads through the secondary school to the University.

But the gain for the community of the latent talent thus to be enlisted in its service is not the

end of the story. Equality in chance of education, even so far as continuation schools can carry education, will do something more. It will tend to diminish the gap between handwork and brain-work, and to raise the status and remuneration of the hand-worker. The development of Electrical Science promises to provide an enormous increase, in the near future, of cheap industrial power. This will be utilised in machinery, much of it delicate, which will require superintendence by highly-skilled supervisors. Production will be increased, and so will wages be. The workman will be not a labourer, but a director of these machines. He will sometimes be, in addition, an improver and inventor. We now realise that it is not either Capital or Labour that really creates the wealth of to-day. Capital can be hired in the money-market by offering interest, and the work of the unskilled labourers can be done by the modern machine. It is *direction*, with adequate knowledge, that really creates wealth, by turning the potential energy of the products of the earth into useful forms of kinetic energy. The workman of the future ought thus to be a director, depending on his mental faculty even more than on his physical power. There will, in all probability, in the end evolve itself a system of such direction in every business, graded from the average worker up to the highest administrator of the concern as a whole. What ought to determine the place of the individual in this hierarchy is brain-power and training. The democratic community will contain within itself an aristocracy, but this will be an *elite* of talent, and will cease to depend on the accident of social position.

The Labour Party has in the past often been narrow and mechanical in its ideals, and has leant too much towards those that are merely material. No wonder, for it has been fighting for emancipation from thralldom. But to-day there is a larger outlook apparent in the programme of the Labour Party. This programme now pairs brain and hand, and the party is apparently about to invite the brain-workers to throw in their lot with all other workers. If this is seriously meant true step on is in sight.* For the Labour Party will cease to be a class party. The political purposes of Labour have till now been too frequently defined in a rigid and harsh fashion. The inscriptions on its banners have too often been crude and repellant. Man requires bread, but he does not live by bread alone. The spiritual is not less real than the material. And if Labour is about to proclaim that knowledge, the might of the spirit is the true and actual source of power, and if it is going—as has been proclaimed in the concluding words of its most recent manifesto—to base its policy on Science, then it will have stepped in advance of the other parties in the State, and it will reap its reward. We shall, as the result, come to attach profound importance as a nation to Education and the training of the coming generation in the highest and widest fashion, and the party which has made the first systematic advance in this neglected region will quickly deliver itself from the reproach of narrowness. Perhaps the day may come when it will even proclaim on its banners that the spiritual alone is the real.

* The Labour Party has officially adopted this policy.—ED.

ECONOMIC NOTES.

INDUSTRIES.

The Cotton Industry in India.

The following are the chief points in the Paper on "Indian Cotton and Cotton Industry" recently read by Sir Dinshaw Wacha in London, before the Royal Society of Arts:—

It is scarcely necessary to observe at the outset that cotton and cotton manufactures occupy a foremost rank in point of value among the few principal articles of merchandise which India annually exports to foreign countries. Her total exports of all kinds of commodities during the quinquennium which ended on the 31st March, 1914, averaged £146'30 millions per annum. Of these the six articles specified below alone amounted to £123'30 millions:—

	Million £
1. Grain, chiefly rice and wheat ...	30'50
2. Cotton and Cotton Manufactures	29'79
3. Jute and Jute Manufactures ...	28'30
4. Seeds	16'24
5. Hides and Skins	9'72
6. Tea	8'71

As far as raw cotton exports are concerned, it may be said that their value had averaged 22'18 million during the quinquennial period just referred to, while the amount recorded on the 31st March, 1917, was £22'78 millions though the quantity of the raw material itself had necessarily undergone diminution and was comparatively less than that exported on the 31st March, 1914. India, it is superfluous to say, is not the only country which extensively grows cotton. Firstly, there are the United States of America, and, secondly, Egypt. These three countries supply by far the largest quantity of cotton grown in various parts of the world. Thus Indian cotton is for all commercial purposes in no way a "monopoly" article of merchandise as jute is. The world which consumes jute almost wholly depends on India.

EARLY MODERN COTTON TRADE.

But throughout all these centuries commencing with the establishment of the first factory in 1612 at Surat, cotton and cotton piecegoods formed the principal and most valuable export trade. The earliest mention of this raw material as an article of trade is to be read in Hakluyt's collection of voyages from a work called "The Process of English Policy" published in 1430. It is stated therein that

"Genoa resorts to English ships which bring silk, paper, wool and cotton from India. It is generally presumed that Indian cotton reached the European countries *via* Levant. The Levant trade was captured by the Dutch, after the Genoese. Beyond the Hakluyt's collections, there was another book published by one Mr. Munn, called the "Treatise on the Trade of India," in 1621. In this work cotton was mentioned among other articles as imported from the Mediterranean. There is no doubt that England, before the discovery of America was supplied with Indian cotton by the Levantine traders, the successors of the Venetian in the trade of India. Mr. William Milburn, in his well-known compendious history of Indian cotton, relates that in 1641 it was stated that "the town of Manchester buys cotton wool in London, that comes first from Cyprus and Smyrna." This would lead us to infer that very little of the fibre at the time was imported from the West Indies Islands. A law was passed in 1660 prohibiting the landing of any cotton which was the growth of Asia, Africa and America except in the English Dominions.

No doubt the East India Company, from the commencement of the nineteenth century, were exceedingly keen on the improvement of and the extension of the cultivation of cotton. The era of steam engine and Arkwright shipping machinery had begun and Manchester was thus favourably situated to forge ahead and compete with Indian made cotton piecegoods. An idea of the value of the exports, both of cotton and piecegoods, from Bombay and Surat in 1805 may be gathered from the following:—

Cotton valued at 85'67 lakh Sicca Rupees.

Cotton Piecegoods at 53'00 lakh.

SURAT COTTON.

The best cotton of the times was, of course, Surat, generic name for the varieties of the staple grown in the various districts of Gujerat of which Surat city was certainly the great entrepot of trade with the West. The appellation continued to be used till Dhollera, the "Fair Dhollera" of daily quotation, superseded it, specially during the course of the great American Civil War of 1861-65 and thereafter till, in its turn, "Broach" was considered as a class by itself of the finest quality, apart from "Fair Dhollera." And it remains to be seen when Broach, may, by the exigencies of trade, share the same fate as the other two, having regard to the notorious fact that the description generally known as "Broach" has also vastly deteriorated in recent years. However, Surat, at the very beginning of the nineteenth century, held a supreme place among the spinners and weavers, of Manchester, and it may, therefore, not be

uninteresting to give a few facts as to what it cost, laid down in Liverpool. In 1805, the staple was selling at Rs. 180 per candy of 784 lbs. The charges of conveyance to Bombay, baling and shipping, came to about Rs. 16 per candy, including merchant's commission at 5 per cent. And here two important items of charge, now bulking so abnormally high, namely, exchange and freight, may be considered. The balance of trade was no doubt in favour of India while Council Bills and other latter day forms of remittance, so familiar to us all, were unknown. The ruling rate of exchange was 2 shillings and 6 pence per Rupee against the average 16 pence Rupee of the opening days of the twentieth century. Freight again came to £22 per ton! This was payable at 90 days' sight after the arrival of the ship; while the rate of insurance was 7 per cent on the value of the cargo. These facts of Indian cotton at the commencement of the nineteenth century are now only of antiquarian interest. Still, the modern trader in this commodity may realise the vast transformation that has taken place during a hundred years in the trade. The Surat cotton of old used to arrive in Bombay in native craft from Surat, Bhavnagar, Porebunder, Verawal and other minor ports.

PRIMITIVE WORK.

That craft still continues to ply in spite of railways and steamships. Whether it is a dow, or a prow or a bugla, there it is and can be seen on any day riding at anchor in Mody Bay, in the Bombay harbour. The pier where the cotton was landed was known to be of a primitive character. It was even primitive, or only a little improved, during the stirring days of the American War. Apollo Bunder as it was called, was crowded to a distance, from the landing, of a couple of hundred yards with "docras" or unpressed bales. These had to be conveyed to the nearest cotton presses round about the Custom House in the Fort or at Colaba to be pressed and baled. But between the period of arrival and shipment a greater part of the cotton had to be warehoused and piled, also in primitive fashion by a gang of coolies. The old bullock cart, still an institution in Bombay City but destined in a few years more to be superseded by the motor lorry, was the only conveyance. It could accommodate only two such docras. So an idea may be formed of the exceeding laborious method of their haulage and final shipment in the wooden ships of old. Cotton ginning and cotton presses have undoubtedly sprung up all over the country more or less in the vicinity of towns where the raw staple is brought from the seats of production for being marketed. Their growth is nearly coeval with that of cotton spinning and weaving factories of which Bombay City and the City of Ahmedabad are the great

strongholds. Hand ginning of the rudimentary type, known from times immemorial, was the only method of separating the lint from the seed before the advent of the machine-guns and presses. It is still in vogue in distant villages and may be seen at work by those curious to learn all about the raw staple and its manipulation in this ancient country. Indeed many a process of cotton, from the first to the last, from ginning to spinning and weaving, all by manual labour, can be inspected in some of the villages where hand-loom industry is still in a fairly flourishing condition.

COTTON FACTORIES.

Calcutta claims the honour of having established the first cotton mill in India. The Goosery mill was erected in 1838, but for many years nothing was heard about its working. For all practical purposes it may be fairly said that the first foundation of producing yarn and cloth by steam power was laid by Mr. Cowasji Nanabhoy Davar, an enterprising Parsee gentleman, who was also known as the pioneer of what may now be called "Swadeshi" (indigenous) Banks in India. He was also the builder of a first ice factory in the City. His bank which was called the "Central Bank of Western India" took its birth in those stirring days of the American Civil War when, flushed with the large profits in cotton, a variety of banks and financial institutions sprung up in Bombay with the rapidity of the prophet's gourd, only to come to grief soon after the close of that war in 1865. Mr. Cowasji started his cotton mill in 1853, with only 5,000 throstle spindles. The writer had seen it as a youth in 1856 when it was in full working order and yielding a handsome profit to the owner. The mill is still standing, albeit greatly enlarged, on the same place where it was first started. About the same time an Englishman named Mr. Landen is reputed to have started a small factory in Broach but nothing much was heard of it till it had some years after developed into a fairly large mill. Mr. Davar may, therefore, be rightly considered to be the founder of the cotton industry in India and his name deserves to be perpetuated for the great impetus his enterprising talents, his patience and perseverance gave to it. Between 1853 and 1876 the number of mills rose to 19 in the Island of Bombay; but till that period it is not known that a single cotton factory had been established elsewhere, save one or two in the city of Ahmedabad. The earliest of those were the Oriental, the Manekji Petit, the Alliance, the Great Eastern, the Coorla and the Murarji. Excepting the Alliance, all were Spinning and Weaving Mills, their founders shrewd men of business as they all were and more or less importers of Lancashire piecegoods, from the very first had clearly realised the importance of

manufacturing cloth suited to Indian consumers. The great rise in the price of the raw material which had reached the phenomenal figure of Rs. 600 per candy, had the blighting effect for the time of suspending work, it being impossible to manufacture cloth of the coarser descriptions only, at the enhanced price of cotton. In fact, the early mills had to shut down till sometime after the restoration of peace in the United States when, of course, the price declined to normality. The revival of trade and credit in Bombay which had been at its lowest for the first five years after the collapse of the share speculation, somewhat akin to that of the South Sea Bubble mania, soon led to the capitalists embarking on the cotton industry which they quickly realised was most profitable and suited to the conditions of the rising city.

FIRST FACTORY AT NAGPUR.

It was also seen that there was a considerable field for their enterprise in areas bordering on the cotton producing districts. Mr. J. N. Tata was the very first to seize the opportunity of establishing a factory at Nagpur and him closely followed Mr. Morarji Goculdas at Sholapur. The Empress Mill, as Mr. Tata called his concern at Nagpur, was started for work on the 1st January, 1877, the factory having been christened on account of that day being the historical one, for proclaiming Queen Victoria as Empress of India. Both the opening of this and the Sholapur Mills was an event of no little importance in the industrial annals of the country, seeing that they were really the pioneers of cotton mills outside Bombay. They paved the way for the establishment of many mills, first, in the Presidency of Bombay, notably Ahmedabad and later, in other parts of India, chiefly in the cotton growing districts. But this rise of mills in the seventies seemed to have alarmed Lancashire. Locally made yarns, chiefly of 20 counts and those below it, had been considerably displacing Lancashire so also some of the coarser descriptions of grey goods such as T. cloths and Domestics. Hence Manchester succeeded in 1877-8 in getting the House of Commons to pass a resolution to the effect that "in the opinion of this House, the duties now levied upon cotton manufactures imported into India being protective in their nature, are contrary to sound commercial policy and ought to be repealed without delay as soon as the financial condition of India will permit. Famine conditions of a severe character then generally prevailing in the country prevented the Government of India and the Secretary of State from carrying out the resolution. But on the 13th March, 1879, the first step in the ultimate repeal of the import duty on cotton goods from Lancashire was taken. The

repeal, it may be stated, was first mooted in 1875 during the Viceroyalty of the late Lord Northbrook who, however, refused to adopt the policy suggested by Lord Salisbury, then Secretary of State. Even in 1879, the financial condition was far from prosperous. The country, in the first place, had not yet emerged from the effects of the famine conditions which had prevailed during the preceding two years, and, in the second place, the Second Afghan War had considerably embarrassed the Indian treasury and a huge deficit was afterwards discovered. The repeal in 1879 was only on the coarsest class of Lancashire grey goods, the amount which the Indian revenues had had to sacrifice being £25,600. This repeal did not satisfy Manchester. Another resolution was passed on the 13th March, 1879, to the effect "that the Indian import duty on cotton goods being unjust alike to the Indian consumer and the English producer, ought to be abolished, and the House accepts the recent reduction in those duties as a step towards that total abolition to which H. M's. Government are pledged." The finances of the country were so greatly disturbed by the Afghan War that nothing could be done till 1882-3. Lord Ripon, a staunch Free Trader, was the Viceroy and Sir Evelyn Baring (the late Lord Cromer), also a robust Free Trader, was the Finance Minister. They both made India, a free trading country, having abolished all import duties, including those on piecegoods.

REPEAL OF DUTY.

At the date of the repeal of the duty on the coarser kinds of Lancashire piecegoods the number of Indian cotton mills had risen to 58 and there is no doubt that the abolition of all duties in 1882-3 gave a great stimulus to the multiplication of cotton factories in the country. Practically the eighties of the nineteenth century witnessed the largest number springing up here, there and everywhere. The number which was only 58 in 1878-9 rose in 1888-9, to 114, say, an increase of 64 mills of which no less than 29, being established in the City of Bombay alone. The spindle strength increased 11'99 lakh and that of the loom by 10,385.

The momentum which the industry acquired in that epoch making decade continued, with more or less force till the outbreak of the present war. The progress from 1889 to 1914 will be seen from the following:—

		Spindles.	Looms.
1914	...	67,78,895	1,04,170
1888	...	24,88,851	19,496
Increase		42,90,044	84,674

Thus during a period covering a quarter of a century India's spindle power has increased 172 and

looms 434 per cent. In 1916, the spindles had increased in number over those of 1914 by 60,892, and the looms by 6,089.

Thus during the last forty years and more India has undoubtedly forged ahead in placing the industry on a sound and prosperous footing. But great as this accession is to her spindle and loom strength, it is unnecessary to state that it is far below that of the United Kingdom.

How do Great Britain and India stand in this respect in comparison to their respective populations?

	Spindles. Per Thousand.	Looms. Per Thousand.
United Kingdom	318.2	17.8
India	21.7	0.35

These statistics plainly tell us how immeasurably India is behind Great Britain and that so far it will be a long while before India can ever hope to boast of the strength which Great Britain enjoys in the cotton industry. And while that is the case and while the long stapled variety of cotton is yet as far distant from realisation as it was fifty years ago, it may be reasonably enquired whether India can displace the enormous import of piecegoods which at the end of 1914-15 measured 242 crore yards, valued at Rs. 42.60 crore, say, £28.4 million.

PIECEGOODS.

Coming to the production of piecegoods, mostly grey and dyed, it may be observed that till 1907 the number of power looms in all India was only 58,436. But there was a considerable spring forward in 1908, as many as 9,484 looms were added. This brought the total to 67,920 till in 1910 it reached 82,725. In 1912, it was 88,951 and in 1916, as already pointed out, it was 110,268. Thus in nine years the loom power has increased nearly 90 per cent, while there is little doubt that the post war period will witness a considerable accretion. Of the increase of 51,832 looms in all India, the share of mills in Bombay City alone come to 21,223, that is to say, against 31,982 in 1907, there were 53,205 in 1916. The balance of 30,609 being distributed over all the other parts of India.

The annual average of cloth production in the Indian mills during the decennium ending 1910-11 was 16.45 crore lbs. but in the last year, the figures recorded were 23.09 crore lbs. In 1911-12 the output rose to 25.21 crore lbs. while the production since was as below:—

	Crore lbs.			
1913-14	...	...	...	27.44
1914-15	...	...	...	27.70
1915-16	...	...	...	35.22
1916-17	...	...	...	37.73

The production during the last three years has mounted up to 37.73, say an increase of 10.03 crore lbs.

But it is necessary at this stage to have a closer analysis of the output in its two-fold aspects. Indian cloth may be divided into two broad divisions for the present, namely, grey and coloured piecegoods. Bleached goods are yet in their infancy, but there is a great potentiality in these as the more important factories have bleaching plants on a scale which will commercially pay. At present, there is only one such fully equipped in Bombay City. A few others have bleaching plants but for all practical purposes they are negligible at present.

The increase in the output of grey goods was 6.10 crores equivalent to 28.5 per cent; while that in dyed goods was 3.72, equivalent to 61 per cent! This plainly indicates that the coloured stuffs have made in the triennium highly gratifying advance. The rate of the progress was double and a little more over that of grey. The reason is not far to seek. Owing to the diminishing imports of dyes from Germany, the market for anilines and alizarine colours began slowly to rise till at last fabulous prices were demanded by the handful of traders in dyes. The mills, at the time, were hardly making anything like a handsome margin of profits in grey compared to dyed goods. These began to buy in the open market. And as there was a keen scramble for their acquisition, the speculative element greatly mounted up the prices. Indeed the dye trade in Bombay City was for a time a pure gamble.

A SECOND ASPECT.

We now turn to the second aspect of the comparative analysis namely description of grey goods. Here it must be prefaced that Indian mills produce some varieties, such as grey "chadars" which are not imported into India. Again jacconets and mulls imported from Lancashire are hardly produced in any quantity at all. And as to coloured goods, Lancashire exports a variety such as cambrics, mada pollams, muslins, mulls, jacconets, dhutis, drills and jeans, saris, shirtings, twills, printers, etc., of which Indian mills only produce checks and perhaps a few negligible varieties. So that there can be no manner of comparison between the coloured goods imported and those manufactured in the country.

It will be seen that even with the diminished import of grey goods of the descriptions which Indian mills also make, the latter, with all their increased output have not been able to rival. The only class of goods wherein there is a marked increase of yardage is in longcloths and shirtings. The English description, before the outbreak of the war, came to 53.98 crore yards. By 1916-17, these had declined

to 15.55 crore yards. Meanwhile the Indian made longcloths and shirtings which were recorded at 29.25 crore yards in 1913-14, have risen to 4,265 crore yards. But it has to be remembered that quality for quality the Indian longcloth is not identical to the English. It is well known that the former is made from 24s, weft and 22s. warp. The English is of higher counts than these. It may be that here and there some mills are turning out the same quality as the English, but it will be found on accurate investigation that the quantity produced is perfectly negligible.

JAPANESE COMPETITION.

But this much may be stated here that Lancashire's apprehension about the competition of Indian mills in the description of the greater bulk of grey, white and coloured goods is unfounded, for the simple reason that India has not yet been able to provide herself sufficiently with such an annual supply of long stapled cotton from which the goods could be manufactured. Rather Lancashire should be apprehensive of the strides Japanese goods are making in the common market of India where Lancashire exports her goods. Japan has the great advantage of using American cotton for her clothes and her mills have for some time past been steadily pursuing a policy of turning out goods of Lancashire descriptions to sell side by side in the Indian markets. Here are some figures:—

Imports from Japan.	In crore yards.	
	1913-14.	1916-17.
Drills and Jeans ...	... 0.17	1.01
Jacconets ...	... ..	0.22
Longcloth and Shirtings ...	0.53	2.91
Shirtings ...	... ..	3.41
White Drills and Jeans ...	... ..	0.17
„ Longcloths ...	... ..	0.04
Coloured checks ...	0.05	0.44
„ Drills and Jeans ...	0.01	0.38
„ Shirtings ...	... ..	0.16
Unspecified ...	0.09	1.17

In 1912-13 the total imports of piecegoods from the United Kingdom and foreign countries was 298 crore yards; while that produced by the Indian Mills came to 122 crores—in all 420 crore yards. In 1917, owing to the sharp decline of Lancashire imports, the total came to only 189 crore yards. But the Indian mills produced 158 crore yards. So that the total reached 347 crore yards. This was 73 crore yards less while the population meanwhile, has been greatly on the increase, practically, taking the census population at 31 crores, there was 13.55 yards per head against 11.20 in 1916-17. Of course, the production of hand-loom, an unknown quantity, should be added to these quotients.

DEPARTMENT OF EDUCATION.

Progress of Education during the Period 1st July, 1917, to 30th April, 1918.

The progress made in Education during the ten months ending 30th April, 1918, is detailed under the heads: Direction, Collegiate Education, Secondary Education, Primary Education, adult Education, Female Education and Special Education including Training of teachers and miscellaneous items.

DIRECTION.

The chief changes under this head are the appointment of Mr. C. R. Reddy, M.A., first as Officer on Special duty and later as Officiating Inspector-General of Education, vice Rajakaryaprasakta Rao Bahadur M. Shama Rao, M.A., who was granted three months' privilege leave from 1st January 1918, preparatory to retirement. The appointment of Technical Assistant to the Inspector-General was made permanent, Mr. Raghavendra Rao, B.A., B.Sc., being confirmed with the designation of 'Assistant to the Inspector-General of Education for Technical and Industrial Education.' A Deputy Inspectress of Girls' Schools was also newly appointed (Government Order No. 724-5/ Edn. 39-16-150 of 19-7-1917).

COLLEGIATE EDUCATION.

Owing to the large number of S. S. L. C. students who applied for admission to the University Entrance classes in Bangalore and Mysore, in June 1917, the number of sections in the University Entrance classes was increased by three—two of them, one for Mathematics and one for Science being attached to the Collegiate High School, Bangalore, and an additional History section being opened in the Maharaja's Collegiate High School, Mysore. These three sections provide in all for 120 additional students. Up-to-date an amount of Rs. 8,290, has been spent on the equipment of the University Entrance classes, and orders worth about Rs. 15,000, have already been placed with contractors and firms for furniture, apparatus and books to be supplied in the current year. The question of putting up a separate building for the Science Laboratory of the Bangalore Collegiate High School is receiving attention and the building to be constructed for the Maharaja's Collegiate High School is shortly to be taken in hand by the Public Works Department, a provision of Rs. 5,000, being made in the current year's budget. In order to improve and enlarge the Collegiate High School libraries, Government have been pleased to grant a sum of Rs. 10,000, to be spread over two years from 1918-19.

SECONDARY EDUCATION.

Botany having been introduced as an optional subject for the S. S. L. C., examination, provision was made for the teaching of the subject in the Collegiate High School, Bangalore, from the beginning of the current academical year and twenty-six students brought up the subject for the recent S. S. L. C. examination. The rules for the award of the Secondary School Leaving Certificate sanctioned by Government in August, 1917, could not be given effect to as the pupils had already selected their optional subjects under the old rules. The rules which were again revised in the light of the discussions at a later meeting of the S. S. L. C. Board are now before Government. The chief changes are the introduction of (i) Commerce as an optional subject under group B, and (ii) the compartmental system, and (iii) the abolition of haphazard choice in the matter of Optionals and their arrangement into definite groups according to affinity.

Steps have also been taken for a course of tuition to be given in 'Pedagogics' as an optional subject under group 'C' in the Collegiate High Schools at Bangalore and Mysore.

With a view to relieve congestion in the centre of Bangalore and in the interests of the large number of candidates appearing for the S. S. L. C. Public Examination from other centres nearer to Tumkur, this place was made an additional centre from the current year and seventy-seven candidates were registered for the Tumkur centre at the recent examination.

The organization of scientific instruction in all the stages from the Primary to the High School standard is received attention and a special officer has been appointed for preparing suitable books in the Vernacular for the purpose, while, with the same view the Department has been patronizing the Kannada Scientific Journal *Vijnana* by the purchase of 200 copies for distribution to Kannada High Schools, Normal Schools, Anglo-Vernacular Schools and other important institutions. Arrangements have also been made to stimulate the production of original works and translations, into Kannada in order to enrich the Kannada literature by up-to-date books on subject of modern interest.

For the promotion of culture among students, a provision of Rs. 5,000, is made by Government for school excursions. The amount having been distributed to Kannada High Schools, Normal Schools, Anglo-Vernacular Schools and other important schools, excursions of educative value have already been undertaken by many of the institutions while the others will avail themselves of the facilities during this summer vacation.

A sum of Rs. 10,300, has been spent up-to-date on the equipment of Secondary Schools.

A new English High School in process of organization has been sanctioned for Davangere. The IV form will be opened this year and the School organization will be completed within the next two years.

PRIMARY EDUCATION.

The greatest progress made during the year is in the field of Primary Education, the expansion of which has received special attention. Up to the end of December 1917, 816 new Grant schools had been opened, and none could be opened during the quarter ending March, 1918, for want of provision, the allotment made for the purpose having been fully worked out. The necessary additional provision having been recently sanctioned by Government, many schools were started during the month of April with the result that there has been a good increase in the number of Village Schools, Adult Schools, Rural Anglo-Vernacular Schools and Practical Instruction Classes. The following list gives the classification and the total number, (1,935) of schools opened from 1st July, 1917 to 30th April, 1918:—

AIDED INSTITUTIONS.

Kannada Boys' Schools	...	...	715
do Girls' Schools	...	...	33
Hindustani Boys' Schools	...	...	45
do Girls' Schools	...	...	4
Panchama Schools	...	...	52
Lambani Schools	...	...	4
Adult Schools	...	...	898
Rural English Schools	...	...	39
			—
Total			1,790
			—

GOVERNMENT INSTITUTIONS.

Practical Instruction Classes	...	...	82
Government Schools (under the Compulsory Education Scheme)	...	...	63
			—
Total			145
			—

Gand Total ... 1,935

The total number of institutions of all classes and grades in the State up-to-date stands at 9,200 (number on 1-7-1917) plus 1,935 (number on 30-4-1918) or 11,135 altogether, which gives on an average one school for every 2.6 square miles.

Compulsory education made satisfactory progress. Sixty-three new schools were opened under the scheme during the current official year and 6,647 boys were newly admitted into all the schools in the compulsory areas. 839 warnings were issued and steps

were taken for prosecution in seven cases which were however withdrawn on the parents' having complied with the rules. The number of exemptions granted were 34. The efficiency of 109 schools was improved by providing additional staff and equipment. Steps have been taken to obtain the necessary census figures and for the formation of attendance committees in respect of 170 new centres brought under the scheme by the Government notification of June 1917. Steps have also been taken to obtain the census figures of girls in the cities of Bangalore and Mysore to which the introduction of the scheme from 1st July, 1918, has been ordered, and proposals have been submitted to Government for the necessary provision for working out the scheme. Efforts are also in progress to introduce the Compulsory Education Scheme during 1918-19 to 300 additional rural areas of which 100 will be those where at present there are no schools.

The education of the Backward and Depressed Classes has received special attention. In a recent order, Government have sanctioned the proposal of the Inspector-General of Education to meet entirely from Government funds the cost of buildings meant for Girls' Schools and schools for Panchamas, Lambanis and other depressed classes, and have provided a sum of Rs. 25,000, for buildings in such cases, and an additional sum of Rs. 25,000, for equipment, in the Budget for 1918-19. From 1st July 1917, up to date a sum of Rs. 34,000, has been spent on the equipment of Primary schools. It may also be mentioned here that in connection with the important question of the timely disbursement of pay and grant to the Elementary schools, a subject that has long been brought up for discussion at the Representative Assembly, proposals by which timely payment can be made practicable, have been submitted to Government. A scheme has also been submitted, in regard to the question of Primary and Secondary school buildings being erected out of borrowed capital by local agencies, with some support from Government. In order to make service in salary grant schools more attractive to teachers and to lessen the difficulty of getting capable teachers for them, proposals have been submitted for the fixed grants being replaced by time-scale grants reaching up to a fixed maximum, while unpassed Grant-in-aid teachers have been notified that unless they pass the Lower Secondary examination within a fixed period after their entertainment, they will not be retained in educational service.

WOMEN'S EDUCATION AND EDUCATION OF THE BACKWARD CLASSES.

Comprehensive proposals for placing Women's Education on a sounder basis, by the remodelling

of the curricula of studies, by the institution of more scholarships, the establishment of District and Taluq Boarding Houses (where possible) and by the organization of a Central Women's Industrial Training Class, are before Government, while the immediate effect of the introduction of the Compulsory Education Scheme to girls will be to raise appreciably the percentage of girls under instruction. The V and VI Forms will be opened in the Vani Vilas Institute this year and an attempt made to staff the school entirely with ladies.

In regard to the education of the depressed classes, proposals for the establishment of two new schools of the Lower Secondary grade, similar to the Central Panchama School in Mysore are before Government. Another fact that may be mentioned in this connection, is the transfer, recently ordered by Government, of the administration of the Backward and Depressed Class Scholarships from the Education Committee of the Economic Conference to the Education Department.

TRAINING AND SUPPLY OF TEACHERS.

There are ten kinds of training provided for at present, for teachers (i) the Graduates' training, (ii) the Undergraduates, (iii) Upper Secondary training, (iv) the Lower Secondary training, (v) the Grant-in-aid teachers' training, *i.e.*, training chiefly for unpassed teachers, (vi) the Special Vacation Class, (vii) Agricultural training, (viii) Physical education, (ix) Scout training, and (x) Montessori training (to be arranged for from June, 1918.) On the whole, there is provision for training nearly 1,200 teachers in the several subjects and methods of teaching. The recent orders of Government have also afforded great facilities for the training of teachers. The number of special Vacation centres was increased from two to six provision being thus made for the training of 240 additional teachers during a short course. In order to meet the growing needs of the Grant-in-aid schools, in the matter of trained teachers, provision has been made for the training of 160 grant-in-aid teachers—80 in Mysore and 80 in Tumkur. Stipends at Rs. 10 each have been sanctioned for twenty Government and ten private or grant-in-aid Lower Secondary teachers to study for the Upper Secondary examination in the Kannada High Schools. Similarly twelve additional stipends at Rs. 15, have been granted for Lower Secondary girls to prosecute studies for the Upper Secondary examination in the Kannada Girls' High Schools at Bangalore and Mysore and two stipends for private or grant-in-aid Hindustani mistresses to join the Lower

Secondary training class of the Training School for Hindustani School mistresses in Mysore. Proposals are now before Government for sanctioning stipends for 200 private students, who having passed the Lower Secondary examination, desire to take training in the Lower Secondary training class of the several District Normal Schools. By this it is hoped that there will be a good contingent of trained men available for teacherships in the new schools or as substitutes for teachers sent for training. Similarly with a view to increasing the supply of Upper Secondary men, 100 scholarships at Rs. 8 each for private candidates to study for the Upper Secondary examination in the Kannada High Schools has been recommended to Government as also the increase in the number of stipends in the Hindustani Upper Secondary class of the Training College, Mysore, from eight to twenty. In order to combine general education and Normal training as far as possible in one and the same institution, Upper Secondary classes have been recommended to be opened in District Normal Schools and Upper Secondary training classes in Kannada High Schools for boys.

Government have recently been pleased to sanction the continuation of the Rural Agricultural Education Scheme for two years more and arrangements have been made for a short course of six to eight weeks' training in Agriculture to a set of teachers from 1st May 1918, while steps are being taken to arrange for a long course to a different set of teachers in Physical training and Scout training were organized and have already been in progress for a few weeks. Course of lectures to be delivered to teachers under Normal training in District Normal Schools, on subjects relating to Hygiene, Sanitation and Ambulance have also been well in progress.

The needs of Industrial and Technical Education have been attended to, and recommendations have been submitted to Government in the matter of opening Commercial Schools in all District High Schools to which such classes are not attached at present. Government have been pleased to sanction the erection of a Power Station for the Mechanical Engineering School, Bangalore, at a cost of Rs. 44,000. Detailed proposals for the reorganization of the Weaving Schools in the State are before Government. The Committees of the Chamarajendra Technical Institute, Mysore, the Mechanical Engineering School, Bangalore, and the Commercial School, Bangalore, were reconstituted during the year. One important point connected with special education is the revision of the scheme of Sanskrit education in the

State which has now been placed on a more efficient basis.

MISCELLANEOUS.

Under this head, the special facilities granted to the *malnad* areas in the matter of education, may be mentioned first. Government have been pleased to extend for three years more the original concession of an allowance of Rs. 2 to all Village Elementary School teachers in receipt of Rs. 10, and to sanction a similar allowance to all teachers in receipt of Rs. 12. The rate of grant for salary grant schools in the *malnad* is Rs. 2 in excess of that for the *maidan*, while the *malnad* grant schools earn a claim to grant with a strength of ten on the rolls and an average daily attendance of seven, unlike the *maidan* schools, where the corresponding figures insisted on, for purposes of grant, are fifteen and ten.

Of other matters of importance under this head may be mentioned (i) the question of the improvement of Kannada Typography in regard to which a recommendation based on the opinions of experts in the language has been made to Government for the purchase of the necessary matrices for preparing type of the approved designs, (ii) the proposals recently submitted to Government in regard to the long discussed subject of vacation to *malnad* schools and Primary and Secondary schools in general, (iii) the permission granted by Government for the printing of the Braille alphabet for the Deaf mutes, which has not been done anywhere else in India, (iv) the completion of Quinquennial Review, (v) the facilities, in the shape of free education and scholarships, provided by Government to the children of soldiers who die in active service, (vi) the Conference of select educational officers, held in February last and the submission to Government of the notes of discussion, and (vii) the alterations in the Mysore Grant-in-aid Code recently proposed to Government, in order to provide for a grant account of hostels and menial establishments of grant-in-aid schools, for which there is no provision, under the existing rules.

CONCLUSION.

In addition to the progress noted above, and the recommendations now before Government, there is a large programme of improvement, expansion and consolidation in respect of which, preliminaries are being worked out, with a view to detailed proposals being submitted to Government in due course.

B. DASAPPA,
For Offg. Inspector-General.

MYSORE ECONOMIC CONFERENCE. PROGRESS IN THE DISTRICTS.

Shimoga.

AGRICULTURE.

Taluk Agricultural Associations.—The District Committee approved the scheme for the organization of Taluk Agricultural Associations and the views of the Agricultural Sub-Committee thereon.

EDUCATION.

New Schools Opened.—Two Girls' Schools, three Night Schools, and four Boys' Schools were newly started in the District.

A Reading Room and A Library.—A Reading Room was started in the Chennagiri Taluk, and a sum of Rs. 50 has been collected towards the starting of a Library at Kalmane.

Itinerant Lecturer.—Mr. Narayanachar of Sorab was appointed as District Itinerant Lecturer, Shimoga.

INDUSTRIES AND COMMERCE.

A Tailoring Class.—A tailoring class was started under the Home Industries Scheme at Kumsi.

The Peripatetic Blacksmith.—The Committee members were in favour of the services of the peripatetic blacksmith being continued during the year 1918-19.

GENERAL.

Children's Savings Bank.—A Children's Savings Bank was opened in the Boy's School at Ayanur.

Hobli Committees.—The District Committee was in favour of Hobli Committees being formed in each of the Taluks of the District for the development of economic activities and recommended a grant of Rs. 50 to each Hobli Committee formed, provided an equal amount was collected locally.

Work Done by V. I. Committees.—Work amounting to Rs. 498 was done by seventeen Village Improvement Committees in the Shikarpur Taluk.

Funds Collected.—A sum of Rs. 212 was collected towards the funds of the Shikarpur Taluk Progress Committee for 1917-18.

Formation of a Town Progress Committee.—The Committee resolved to form a Sub-Committee of seven gentlemen to consider the question of forming a Town Progress Committee in Shimoga.

The Economic Fund.—The letter from the Secretary, Economic Conference, calling for the opinion of the District Committee as regards the advisability of collection of funds for economic purposes in the District by inducing every person paying revenue of

any kind to Government to contribute to the Economic Fund according to his means and capacity and suggesting a sliding scale therefor, was read and the Committee was of opinion that no additional contribution towards the Economic Fund could be asked for from the people as the villagers were already contributing towards the Village Common Funds, Taluk Progress Committee Funds, and the Taluk and District Conference Funds.

Chitaldrug.

AGRICULTURE.

Introduction of Improved Ploughs, etc.—Twenty-eight ploughs and twenty-four plough shares (with other implements) were introduced by the Agricultural Department.

Sugar-cane Mills.—Seven sugar-cane mills were supplied to ryots and jaggory boiling demonstration was held in the Chitaldrug Taluk.

EDUCATION.

New Institutions.—One grant-in-aid school, two night schools, two libraries and nine reading rooms were started in the District.

Collection of Funds.—A sum of Rs. 21,800 was collected for a Lingayet Students' Hostel, and a Printing Press at Harihar.

INDUSTRIES AND COMMERCE.

A Suction Gas Pump.—A suction gas pump was installed at Asagod in the Jagalur Taluk for irrigation purposes.

The Itinerant Blacksmiths.—Regarding the selection of certain important centres for permanently keeping the itinerant blacksmiths till the people in rural areas were sufficiently trained, the Superintendent, Industrial School, and the Asst. Mechanic have been asked to furnish the Committee with a note on the items of work to be attended to by the smith.

GENERAL.

Foundation Stones Laid.—Foundation Stones were laid for a Town Hall and a Students' Home at Harihar and for a Chattram at Nandigudi.

Conferences and Shows.—Cattle Shows were held at Nandigudi and Harihar commencing from the 26th March, and 4th April, 1918, respectively. A Panchama Conference was held in connection with Nandigudi Cattle Show and a Cattle Owners' Conference was also held in connection with the Harihar Show.

CONFERENCES AND MEETINGS.

Chitaldrug District.

The Chitaldrug District Conference was held in the Sri Chamarajendra Memorial Hall, Chitaldrug, from the 16th to the 19th March, 1918. Special arrangements had been made for the attendance of the ladies during the Conference and it is gratifying to state that the opportunity was availed of by many. The Conference was opened on the 16th March, 1918, at 12 noon by Mr. Zahiruddin Mecci, B.A., Deputy Commissioner, Chitaldrug District. In the course of the opening speech the President quoted some of the items of work showing the progress achieved under the Village Improvement Scheme during the preceding four months. He then referred briefly to the several munificent gifts made for various purposes and appealed to the audience to work with redoubled vigour and enthusiasm. The District Economic Superintendent read a detailed report of the work done in the District during the calendar year 1917, under agriculture, education, industries and commerce. Lectures were then delivered on (1) Economic Value of Health; (2) Economic Development in the District; (3) Village Improvement—a Religious Duty; (4) Protection of Children; (5) *Desonnathi*; and (6) Preparation of woollen yarn. The Propositions placed before the Conference were next taken up and discussed and resolutions were passed. The lists of major and minor wants were gone through in detail and the lists were revised in the light of suggestions made. The Conference was continued the next day also when local grievances were heard and noted for action. Mr. C. R. Reddy, M.A., Inspector-General of Education, presided over the Teachers' Conference held on the second day when important subjects were discussed. The Agricultural Conference was presided over by Dr. L. C. Coleman, Director of Agriculture, who offered several practical suggestions for improving cotton and sugar-cane cultivation. The Co-operative Conference was held on the 19th March and Mr. R. Ranga Row, Offg. Registrar of Co-operative Societies, presided over the deliberations. As part of the Conference, a Civic and Social Conference was also held for the first time in the District, on the 19th March, and was presided over by the Deputy Commissioner. After the President's opening speech, lectures were delivered on (1) the Duties of Citizenship; (2) Uplift of Panchamas; (3) Beautifying the Chitaldrug Town; (4) Reduction of Expenses at Marriages and Funerals; (5) Raising the Marriageable Age of Girls; and (6) the Necessity of Founding a Ladies' Club at Chitaldrug. A District Association was formed to work out the programme of the year and branch

associations were formed at each of the Taluk Headquarters.

The District Exhibition was opened by the Deputy Commissioner on the 16th March, and was kept open to the public till the 22nd. The exhibits were confined to the Chitaldrug District. These with the choice collection of minerals found in the District, kindly lent by the Department of Mines and Geology, numbered about 3,000.

Since the date of the last District Conference held in February, 1917, Taluk Conferences were held at Molakalmuru (7th and 8th March, 1917), Hosadurga (20th May, 1917), Chitaldrug (22nd July, 1917), Hiriur (6th Oct. 1917), Chellakere (25th Nov. 1917), Holalkere (18th Dec. 1917), Jagalur (22nd Dec. 1917), Davangere (19th Jan. 1918), and Harihar (23rd Jan. 1918). Besides the above the Yemmhatty Kurubar Conference and the Malebennur and Harihar Hobli Conferences were also held. At Malebennur, an Industrial and Agricultural Exhibition and a Horticultural Show were arranged for on a small scale and the Exhibition was confined to the products of the Sub-Taluk. At these Conferences papers were read and lectures delivered in addition to hearing the local grievances, suggesting remedial measures and discussing the major and minor wants. Panchama Conferences were for the first time arranged in the District in connection with the Taluk Conferences held at Jagalur and Davangere. A good number of Holeyars and Madigars were present. At Davangere many Lambanies also attended the Conference.

The Chitaldrug District Exhibition was opened by the Deputy Commissioner on the 16th March and was kept open to the public till the 22nd. The Exhibits were confined to the District and the Department of Mines and Geology were kind enough to lend a choice collection of minerals found in the District, for the occasion. A sum of Rs. 250 was sanctioned by Government and Rs. 400 was contributed by the local bodies for expenditure. Except for the advice and guidance given, all the Taluk Conferences were organized by the local people who evinced much interest in making the undertakings a success.

Kolar.

The Kolar Taluk Conference was held in the Taluk Cutcherry on the 20th April last, with the President of the District Committee in the chair. After the reading of the Report, local wants and needs were considered and discussed, the most important of them being the starting of a tile factory, towards which the people were prepared to contribute Rs. 20,000, provided the Government advanced an equal amount; the opening of a railway line to Mulbagal; sandal-wood plantation; the relationship between Inamdars and tenants; and kambli yarn weaving. After the concluding remarks of the President the Conference ended.

SHOWS AND EXHIBITIONS.

Hemagiri.

In connection with the annual *jatra* of Sri Venkataramanaswami at Hemagiri, a Cattle Show was held. The Show commenced on the 16th February last, and continued for five days. There were at the Show more than 22,500 head of cattle and thirty goats and sheep, the important varieties of cattle represented being *hallikara*, mixed breed, *sanna malligae*, *dodda malligae*, *paduvala* and *gujjamavu*. The largest purchases were from Coimbatore, Salem and Tinnevely Districts of the Madras Presidency, the prices ranging from Rs. 110 to Rs. 400. A Committee of nine gentlemen and the Sub-Divisional Officer and the Veterinary Inspector selected the cattle deserving of prizes. Out of the 156 pairs of bullocks, 50 calves and 30 pairs of breeding bulls that were brought into the special enclosure, two pairs of bullocks useful for draught purposes, three bullocks useful for agricultural purposes, four calves and two breeding bulls were awarded prizes which were kindly distributed to the owners of the winning cattle by the Sub-Divisional Officer. A sum of Rs. 2,050 was realised from the sale of toll on cattle. The taxes on manure and shops amounted to Rs. 150 and Rs. 300 respectively. As usual the net profits generally go to Muzroi Funds, a moiety of the amount being transferred to the District Funds for the expenditure on sanitary arrangements and for prize giving for selected cattle.

Nandigudi.

A Cattle Show was held at Nandigudi, Harihar Sub-Taluk, on the 27th and 28th March last, and was opened by Mr. M. Zahiruddin Mecci, B.A., Deputy Commissioner and President, District Board, Chitaldrug District. The business connected with the Show was managed by a Committee of which the Deputy Amildar of the Sub-Taluk was the President. There were 8,456 head of cattle, and a fee of one anna per head was newly levied this year to meet the expenses of the Show. The right of collecting this fee was disposed of by public auction and a sum of Rs. 500, was realised. Thirteen prizes consisting of gold and silver medals, silver cups, brass plates, and cash were awarded to the owners of the deserving cattle. The income from the Show amounted to Rs. 691-12-0, and the expenditure to Rs. 369-13-0, leaving a surplus of Rs. 321-15-0. In connection with the Show a Panchanna Conference was held. The Deputy Commissioner of the Chitaldrug District, who presided over the function, made a stirring appeal to the community to give up drinking and other evil habits. A few instructive lectures were also delivered on personal Hygiene, Thrift and

Temperate Habits. Sivananjunda Desikendraswamy of the Nonabaradhya Lingayet Mutt deserves special mention for generously undertaking to feed thousands of persons daily at his own cost during the *jatra* and for being the originator of the *jatra* and its supporter during the last fifteen years or so.

Harihar.

In connection with Sri Sangameswara Swami *jatra* a Cattle Show was held at Harihar from the 4th April last, for three days. In declaring the Show open on the first day at 5 P.M., Mr. Zahiruddin Mecci, B. A., Deputy Commissioner and President of the Chitaldrug District Board, made an interesting speech in the course of which he pointed out the advantages of such shows and suggested the methods to be adopted by the ryot population to improve the breed of cattle. Mr. Suryanarayana Rau, the well-known astrologer of Bangalore delivered a lecture on "Sun's rays and its effects on mankind." Mr. K. H. Ramiah, Bar-at-law delivered a lecture on "Increasing the efficiency of Indian labour." Mr. Krishna Rau of the Chitaldrug High School conducted some experiments in physical science, and explained the same in Kannada. Papers were then read on (1) Dairy Farming; (2) Inoculation of Cattle; (3) Cattle diseases and how to prevent them; and (4) Cattle-breeding. A Conference of the cattle-owners was also arranged for, and the business of the same was conducted for two days. Cultivation of *gomal* land, breeding of cattle, veterinary training to the school-masters were some of the useful subjects discussed at the Conference. There were in all nearly 15,000 head of cattle, and a sum of Rs. 825 was realised from the admission fees. The highest prize fetched by a pair of bullocks was Rs. 869, and the lowest was Rs. 30. The cattle deserving of prizes were selected by a Committee appointed for the purpose, and the selected cattle were, as suggested by the President of the District Board, put to practical tests by a Committee of judges, and prizes in the shape of gold medals, silver cups, tumblers, brass plates, etc., were then awarded to the owners by the Deputy Commissioner on the 7th April, on which date the Show came to a close. The total receipts and expenditure amounted to Rs. 1,030-11-0 and Rs. 697-8-4, respectively. Among other events that took place in connection with the Show, the following deserve special mention; (1) Sadhu Lingayat Conference; and (2) Laying the foundation of the Town Hall and the Lingayet Hostel proposed to be built at Harihar.

Vanarasi.

In connection with the car festival at Vanarasi a Cattle Fair was held from the 16th April, 1918. There were about 15,000 head of cattle at the Fair, most of them being ploughing bullocks of the local breed. The right to collect taxes at the prescribed rates was leased out to a contractor for Rs. 600. Mr. M. S. Narayana Rau, the then acting Amildar, visited the place during the *jatra*.

Maddur.

In connection with Sri Narasimhaswami *jatra* at Maddur, a Cattle Show was held for three days commencing from the 30th April last. There were about 4,000 head of cattle at the Show and a Committee selected the cattle deserving of prizes. Money prizes were given to the exhibitors of the best cattle, the District Board allotting Rs. 50 for the purpose.

CORRESPONDENCE.

To

The Editor,

Mysore Economic Journal, Bangalore.

Wood Distillation Plant.

Sir,—Your *Journal* Volume 3, No. 10, dated October 1917, has been sent on to us, and has been perused with interest.

* * * *

We specialise in plants for the destructive distillation of wood with the recovery of all by-products, and we enclose a type-written description of our plant and process.

*Woodville Street,
Govan, Glasgow.*

BLAIR, CAMPBELL &
McLEAN LTD.

The following is the descriptive account referred to above:—

Our plant is of the most improved design and has been thoroughly approved in practice, and is similar to that supplied in connection with War Office requirements. Particular attention is given in the design to ease of operation, long life of each piece and high yield of product. The plant is supplied complete, ready to set on required foundations and in the necessary buildings.

The nature and amount of products to be expected per cord of 128 cu. ft. of wood, with the average normal prices for same in England, are as follows:—

- (1) Charcoal—900 to 1,000 lbs. ... £2·10 per ton.
- (2) Grey Acetate of Lime—180 to
220 lbs. ... £9·10 „ „
- (3) Refined Wood Naphtha—5 to
7 gallons ... 3/- per gallon.
- (4) Methyl Acetone—2 to 3 gal-
lons ... 3/- „ „
- (5) Hard Pitch—150 lbs ... £2·10 per ton.
- (6) Wood Creosote Oil—5 gallons... 10d. per gallon.
- (7) Light Wood Oils—2 to 3 gal-
lons ... 10d. per gallon.

The labour required for operating a 16 cord plant is in England about eighteen men, ten of whom are common labourers at approximately 20 per week, and five are more skilled men at about 35 per week, with the balance as Foremen at £2 stg., per week. One Superintendent operates the plant and usually receives a salary of about £200 stg., a year.

The fuel required is approximately 40 tons per week of coal, half of which is ordinary "Slack" and the other half, Steam Coal.

Depreciation and repairs are usually charged at about 8 per cent on the whole plant.

The method of operation may be outlined roughly as follows:—The air-dried wood from the forests is piled into steel trucks in 4 ft. lengths, each truck holding approximately 2 cords, and the trucks are wheeled into horizontal steel retorts which are sealed up by means of doors so that they are air-tight. Heat is applied by means of fire underneath them and the temperature raised until the wood is decomposed and the various products are driven off in the form of gases. These gases are passed out of the retorts through outlets, and into condenser where the valuable products are condensed and drawn off, the non-condensable gases passing away through the scrubber, to clean them and led under the retorts where they are used as fuel. The crude liquor from the condensers is settled in a series of wooden vats where the tar separates out and a watery liquor is drawn off the top. This watery layer is distilled to free it from dissolved tar, and the watery acid, containing wood naphtha, acetone and oils is neutralized with lime, forming the Acetate of Lime solution. The lower layer in these settling vats composed of tar containing some acid, is also drawn off and distilled separately, where the acid, naphtha and so forth is recovered in the same manner and neutralized. The tar from both these distillations is removed to a steel Tar Still, where it is distilled by fire, producing creosote oil and pitch. The neutralized liquor, containing Acetate of Lime, Wood Naphtha, etc., is then distilled in a Lime Lees Still, where the naphtha and acetone are removed, the Acetate of Lime remaining in the liquor. The naphtha and acetone, along with the light oils, are then rectified in a Rectifying Still, which produces highly refined naphtha, acetone and oils. The residual liquor from the Lime Lees Still is then evaporated to crystallizing point, then it is transferred to Drying Pan on top of the retort, where the acetate is dried to a mush. This mush is then thrown on top of the retort on a special kiln-drying floor heated by the waste gases from the furnace, where it is kiln-dried, ready for shipment. The residue left on the steel trucks in the retorts in charcoal, which is withdrawn at the end of the distillation into air-dried coolers where it remains for twenty-four hours until the next charge from the retort is withdrawn, when it is ready for market, in large lumps.

The whole circle of the process usually occupies from twenty to twenty-four hours, depending on the condition of the wood as to dryness, etc. This condition also has quite an effect on the yield of products obtained, wet wood requiring more fuel for distillation and yielding smaller amounts of products per cord, on account of the decomposition in the retort caused by the presence of moisture.

Canada's Wood-pulp.

Sir,—I enclose an extract from *Industrial Canada* for December, 1917, on "Canada's Wood-pulp." If Mysore conserves and fosters her forests more carefully and uses her forest resources more economically than hitherto she can secure much larger wealth annually by supplying a part of the requirements of the European countries, whose forests have been so ruthlessly ruined by the present world-war. It is unquestionably true that we are more wasteful in the daily use of our timber and other forest produce than the rapidly increasing demand and rising values, and our limited forest resources justify. We can no longer afford to be unmindful of these facts in the face of the enormous demand for wood which will arise in the very near future, all the world over and especially in the countries directly affected by the war.

RAO SAHIB M. RAMA RAO.

The following is the extract referred to above from the *Industrial Canada*, Page 1,120, dated December, 1917:—

Canada holds the only large forests in the whole British Empire. Australia and New Zealand and South Africa, have sacrificed most of their original timber to the fire fiend and ruthless exploitation. These facts emphasize Canada's strategic position as containing the only wood pile available to the Empire, except those of Russia. Sixty per cent of John Bull's huge timber demand is supplied by the Russian people to-day, for the British Isles provide only one log out of eight actually needed for home use. What part Canada's forests will play in British trade after the war is problematical, but there is no lack of prophets to predict that every square mile of growing timber will double in value under the strain of post-bellum demand from the devastated districts of Europe. Meanwhile, Canadian Governments can prepare to take full advantage of increasing timber values by thorough fire protection and scientific control of wasteful lumbering.

Aloe Fibre Industry.

Sir,—It is an admitted fact that the fibre production of the Mysore State is insignificant in comparison with that of the other parts of India. The Province, however, is rich in wild aloe plants, e.g., *Agave Cantal* or *Agave Vivipara* and *Fourcroya Gigantea*—the former yielding the best substitute for the well-known Sisal hemp of commerce, while the latter the true Mauritian hemp. But in spite of the fact that there is much scope for the development of this wild plants which are being wasted no one has even thought it advisable to begin this industry in right earnest.

It is no doubt true that several half-hearted attempts were made to utilise this waste but they were unsuccessful for the best reason that those who were engaged in this business had no idea of the *modus operandi* of extraction and other details which it is indispensable to know before taking up this particular industry. Several firms were started with European capital but they were not in proper order. At some of the jails the prisoners extract the fibre and use it for making cordage and carpets called "Moonj" products. But the process adopted by them and still followed by some is primitive, i.e., consisting of soaking in water called retting and beating. This process, as is too well known makes the fibre weak and unfit for commercial purposes. Again the leaves contain an Acrid juice which when it comes in contact with the skin produces eczema of a fearful type and as such the extraction of the fibre by hand is considered as degrading and fit only as a Jail Industry. To avoid the touch of this juice and to get the fibre direct from the leaves many devices were adopted which were not successful from a commercial point of view. Later on machines were constructed on the Continent and in America which successfully dealt with the leaves. But these machines were rather cumbersome and costly and at the same time involved much expense in exploiting. These machines and similar small machinery were brought out to India but they did not meet with much favour simply because they were rather heavy, complicated, costly and difficult to handle and quite inadequate for cottage industries. So that a necessity for a cheap, efficient, portable and simple machine was keenly felt throughout India. Attempts were made and I myself tried to make such a machine as will suit everyone and at the same time will cope with every kind of leaf fibre and I am glad to say my attempts have been successful. The model of the machine will be on show from 3rd March, 1918, at Bombay and any one interested in the matter should write to me direct.

It is needless to impress on the readers the profitable nature of the business. It is well known that aloe fibre is used for a variety of purposes and that this fibre possesses considerable merit as a textile raw material and can very well be used for many of the ordinary purposes of every day life. The demand of aloe fibre is now-a-days ever on the increase and is highly valued by the European and American dealers as well as almost all the Indian rope-makers and carpet-makers. The price of machine-cleaned aloe fibre ranges between £25 to £40 a ton at the London market and Rs. 14 to 18 a maund at Calcutta and Bombay market. The fibre which was made according to the primitive method did not fetch £5 a ton and now the dealers or rope-makers are rather chary of having anything to do with Indian aloe fibre made by hand. The profit from a ton of fibre comes up to £15 to £20 exclusive of all expenses.

Princess Street,
Bombay.

J. A. SIRCAR.

QUERIES.

Hints to Correspondents.

Write on one side of the paper only. (2) Write each query on a separate sheet of paper. This will facilitate answering questions as in many cases they may have to be referred to experts. Put your name and address down on every such sheet. No attention will be paid to unsigned queries. (3) Drawings for illustrations should be on separate sheets of paper. They must be made in black ink only on white paper—not in pencil or colour—and twice the size they are intended to appear, especially reference letters and figures. (4) Put titles to queries, and, when answering queries, put the number as well as the titles of the queries to which the replies refer. (5) No charge is made for inserting letters, queries, or replies. (6) Letters or queries asking for addresses of manufacturers or correspondents, or where tools or other articles can be purchased, or replies giving such information, cannot be inserted except as advertisements. No question is answered through the post. (7) Letters sent by correspondents, under cover to the Editor, are not forwarded and the names of correspondents are not given to inquirers. (8) As the space devoted to queries and replies is limited, they should be drawn up as briefly as possible. (9) To facilitate reference, correspondents, when referring to any letters previously inserted, should mention the number of the letter, as well as the page on which it appears. (10) All communications should be addressed to the Editor, *Mysore Economic Journal*, "Ringwood", Bangalore.

Query 5.—Will you please let me know where I can get a market for the following articles as also the process of manufacture of Thymol from Ajwan seeds?

- (1) Old waste tin pieces in lots, and
- (2) Old and new pieces of paper in lots.

Banganapalli.

M. H. P. GHATALAH.

BOOKS IN BRIEF.

Terms of Industrial Peace.—By Alex. Ramsay. Constable & Co. Ltd., London. 3s. net.

This is an interesting and suggestive book on the relations of employers and employed. Conditions in India are changing so fast that the need for greater and closer attention in regard to these relations is becoming more and more imperative. Mr. Ramsay outlines a scheme for the English conditions. This scheme is not without interest to us here in this country. After reading the book we can well say that Mr. Ramsay approaches the subject in a perfectly neutral spirit. He has lived as a workman and so knows the position of the average working man in regard to most matters affecting him. He also knows the complexity of the industrial position of to-day. In a word, his remedy is born of the inner conviction that both sides stand to gain by compulsory arbitration rather than by strikes and lock outs. He would make the provisions in regard to arbitration under the Munitions of War Act, 1914, applicable after the War on an extended scale. Such arbitration should, in his opinion, be made universal. He urges that such arbitration should be made available through process of law. Mr. Ramsay's views will doubtless be criticised adversely and in parts, perhaps, even violently attacked. But we have reached a stage of industrial development in which it ought to be possible for us to make strikes and lock outs altogether impossible, if not exactly illegal. Mr. Ramsay has some rigorous observations on "Food Control" to which we are just getting accustomed to in this country. We shall only quote a sentence or two. He stigmatises the action of merchants and others who hoard and withhold stock for a rise in price as "unscrupulous usury for which no defence can be found." He adds: "Their attitude is a customary one, and operates in normal times even as now. The only difference is that the sufferings of the country to-day have given them an unparalleled opportunity to prey upon Society. We cannot abolish them, but we can control them. Either by direct legislation or by large operations on the market, we can fix selling prices, and as soon as Labour becomes convinced of the possibility of such action, there is very little doubt that the Government will have no alternative but to take the necessary protective steps." Mr. Ramsay's book is a thoroughly readable one and we commend it to all interested in the subject of the peaceful settlement of Labour disputes.

The Government of the British Empire.—By Edward Jenks, B. C. L., M. A. John Murray, London. 6s. net.

Too high praise cannot be bestowed on Mr. Jenks' effort to present a book of the large theme he has chosen for himself. This is a book which is original in design and bold in the carrying out. An advantage it possesses over others—and there are several well-known ones that could easily be mentioned—is that it is written in language that is easily understood and is not overlaid with technical and other details. It is a straightforward account of the political institutions of the Empire without comment or criticism. Its plan being more descriptive than critical, it ought to prove highly useful as much to the student as to the publicist in this country. At the present moment the air is thick with the "reform" idea and

no better guide than this book can be recommended to those who are really in earnest about knowing about the political institutions flourishing in the Empire to-day. Among other things, they will find a most interesting account of what "Responsible Government" means in connection with the Dominions in this volume. (pp. 64 to 73). The portions relating to India in this book may not seem adequate to some, but its plan is such that, perhaps, more could not be admitted into its pages.

ACKNOWLEDGMENTS.

Annuaire International de Legislation Agricole (*International Yearbook of Agricultural Legislation.*) Text in French, Analytical Introduction and Index in English. Rome. 1917. Price, Fr. 10.

A Manual of Hindu Ethics. By G. A. Chandavarkar (H. E. H. the Nizam's Educational Department.) With a foreword by Professor Rama Deva, B. A., M. R. A. S. Price, Re. 1.

The Co-operative Movement. By V. Venkatasubbaiya, Member of the Servants of India Society, and Vaikunth L. Mehta, Manager, Bombay Central Co-operative Bank. Price, Re. 1.

RECENT PUBLICATIONS.

The Land. A Plea. By John Galsworthy. $8\frac{1}{2} \times 5\frac{1}{2}$, 23 pp. Allen and Unwin. 6d. n.

Productive Dairying. By R. M. Washburn. Professor of Dairy Husbandry, University of Minnesota. 131 Illustrations in the text. (Lippincott's Farm Manuals.) $8\frac{1}{2} \times 6$, xii. + 432 pp. Lippincott. 7 s. 6 d. n.

The American Revolution in our School Text-books. An attempt to trace the influence of early school education on the feeling towards England in the United States, by Charles Altschul. With an introduction by James T. Shotwell. $8\frac{1}{2} \times 5\frac{1}{2}$, 168 pp. New York: George H. Doran Company.

The Dawn of Mind. An introduction to child psychology. By Margaret Drummond. $7\frac{1}{2} \times 5$, xi. + 179 pp. Arnold. 3s. 6d. n.

A Polish Manual for Self-Tuition. Containing a concise grammar with exercises; reading extracts with literal interlinear translation and Polish-English Vocabulary: and a select English-Polish vocabulary. (Trubner's Language Manuals.) $7\frac{1}{2} \times 5$, 147 pp. Kegan Paul. 2s. 6d. n.

The School and Other Educators. By John Clarke. $7\frac{1}{2} \times 5\frac{1}{2}$, ix. + 228 pp. Longmans. 5s. n.

The Old Guilds of England. By Frederick Armitage. $7\frac{1}{2} \times 5$, 226 pp. Weare & Co. (53, King William-street, E. C. 4). 6s. n.

The Motor Industry. Its growth, its methods, its prospects, and its products; with an indication of the uses to which motor vehicles of all kinds are, or could be, advantageously applied. By Horace Wyatt, Hon. Secretary of the Imperial Motor Transport Council, etc. (Pitman's Common

Commodities and Industries.) $7\frac{1}{4} \times 4\frac{3}{4}$, viii. + 132 pp. Pitman. 2s. n.

Sales Promotion by Mail. How to sell and how to advertise. A Handbook of Business Building. $9\frac{1}{4} \times 6\frac{1}{4}$, v. + 359 pp. Putnams. 10s. n.

Industry and Finance. War Expedients and Reconstruction. Being the results of inquiries arranged by the Section of Economic Science and Statistics by the British Association during the years 1916 and 1917. Edited by Adam W. Kirkaldy, Professor of Finance in the University of Birmingham. $8\frac{1}{4} \times 5\frac{1}{2}$, viii. + 371 pp. Pitman. 4s. 6d. n.

The Training of Our Industrial Forges. By H. L. F. Orcutt. (Reprinted from "Engineering," August 24, September 7 and 14, 1917.) $7\frac{1}{4} \times 4\frac{3}{4}$, vii. + 55 pp. "Engineering." 1s. 6d. n.

War Finance. By J. Shield Nicholson, Professor of Political Economy in the University of Edinburgh. $8\frac{3}{4} \times 5\frac{3}{4}$, xxiv. + 480 pp. P. S. King. 10s. 6d. n.

Currency and Finance in Time of War. A lecture by F. Y. Edgeworth, Professor of Political Economy in the University of Oxford. 9×6 , 48 pp. Oxford, Clarendon Press. London: Milford. 1s. n.

The Staple Trades of the Empire. By various writers. Edited by Arthur Percival Newton. $7\frac{3}{4} \times 5$, 184 pp. Dent. 2s. 6d. n.

The Function and Place of Advertising in Modern Business Economics. With particular reference to the attitude of Government Departments to advertising. $8\frac{1}{2} \times 5\frac{1}{2}$, 36 pp. Association of British Advertising Agents (Donington House, Norfolk-street, W. C. 2).

The Theory and History of Banking. By Charles F. Dunbar. Third Edition. Enlarged by Oliver M. W. Sprague. $7\frac{1}{2} \times 5$, ix. + 297 pp. Putnams. 6s. n.

Rural Reconstruction in Ireland. A record of Co-operative Organization. By Lionel Smith-Gordon and Laurence C. Staples. With a preface by George W. Russell (Æ.) $8\frac{3}{4} \times 5\frac{3}{4}$, xiii. + 279 pp. P. S. King. 7s. 6d. n.

Evolution or Revolution. A problem of forces, by "Ironicus." $7\frac{1}{2} \times 5$, viii. + 161. pp. Cursitor Publishing Company. 3s. 6d. n.

The Right to Live. By Max Plowman. $6\frac{3}{4} \times 5$, 20 pp. King and Jarrett. (Holland-street, Black-friars, S. E.) 1d.

Masters and Men. A new Co-partnership. By Thos. Foster. $9 \times 5\frac{1}{2}$, 10 pp. Headley. 3d. n.

The Science of Power. By Benjamin Kidd. $7\frac{3}{4} \times 5\frac{1}{4}$, v. + 306 pp. Methuen. 6s. n.

English Spelling and Pronunciation.—This is a suggestive little book on English Spelling and pronunciation by a writer who has paid much time and attention to these matters. Mr. Narasinga Rao approaches the task he has set to himself with full knowledge of the difficulties that Indian students feel in mastering English. His book ought to be useful to teachers and students alike of English.

THE MYSORE ECONOMIC CONFERENCE.

BIRTHDAY SESSION, 1918.

Report of Proceedings.

FIRST DAY'S PROCEEDINGS.

MONDAY, 17TH JUNE.

IN accordance with Official Memorandum No. 5580-5659, dated 15th March, 1918, convening a session of the Mysore Economic Conference during the Birthday Festivities of 1918, the Conference assembled at the Public Offices, Mysore, on Monday, the 17th June, at 12 noon.

There were present the following:—

President.

Sir M. Visvesvaraya, K.C.I.E., Dewan of Mysore, in the Chair.

Vice-Presidents.

Rajasevadhurina Sirdar M. Kantaraj Urs, B.A., C.S.I., First Member of Council and Chairman, Agricultural Committee.

2. Mr. P. Raghavendra Rao, B.A., B.L., Acting Second Member of Council and Chairman, Industries and Commerce Committee.

Members.

Heads of Departments and other Officers.

3. Rajamantrapravina Diwan Bahadur J. S. Chakravarti, M.A., F.R.A.S., Financial Secre-

tary to Government and Chairman, Education Committee.

4. Mr. K. R. Srinivasa Iyengar, M.A., Revenue Commissioner in Mysore.

5. Mr. Srinivasacharya Cadambi, B.A., L.C.E., Chief Engineer.

6. Mr. M. G. Rama Rao, B.A., Conservator of Forests.

7. Mr. C. R. Reddy, M.A. (Cantab), Inspector-General of Education.

8. Mr. B. Jayaram, F.G.S., Acting Director, Department of Geology.

9. Mr. C. S. Balasundaram Iyer, B.A., Chief Secretary.

10. Mr. V. Rangaswami Iyengar, A.C.E., B.C.E., Director of Industries and Commerce.

11. Dr. L. C. Coleman, M.A., Ph.D., Director of Agriculture.

12. Mr. S. G. Forbes, B.Sc., E. & M.E., MEM., A.I.E.E., Chief Electrical Engineer.

13. Mr. R. Ranga Rao, B.A., B.L., Registrar of Co-operative Societies.

Deputy Commissioners of Districts.

14. Mr. T. Chokkanna, B.A., Bangalore.

15. Mr. K. Matthan, B.A., Mysore.

16. Mr. B. Venkoba Rao, B.A., Kolar.

17. Mr. A. Subramanya Iyer, B.A., Tumkur.

18. Mr. C. Venkata Rao, B.A., Hassan.

19. Mr. C. Devaraj Urs, Kadur.

20. Mr. M. A. Narayana Iyengar, B.A., B.L., Shimoga.

Members nominated by Government.

21. Rajasabhabhushana Diwan Bahadur K. P. Puttanna Chetty, C.I.E.
22. Mr. K. Chandy, B.A.
23. Mr. P. G. D'Souza, B.A., B.L., Secretary to Government, Education and Agricultural Departments, and Secretary, Mysore Economic Conference.
24. Mr. P. A. Barton.
25. Mr. M. Chengiah Chetty, B.A.
26. Mr. M. L. Vardhamaniah.
27. Mr. R. T. Mahadeva Rao.
28. Mr. B. K. Garudachar.
29. Mr. H. Subba Rao.
30. Mr. B. Usman Khan.
31. Mr. P. M. Basappa.

Members of the Representative Assembly elected by the Members of that Assembly held on the 24th April, 1917.

32. Mr. Karnik Krishnamurthi Rao.
33. Mr. H. Krishna Sastri.
34. Mr. M. Venkatakrishnayya.
35. Mr. M. Basavayya.
36. Mr. A. Ramanna.
37. Mr. Maralu Siddappa.
38. Mr. Singri Nanjappa.

Non-official Members elected by District Electorates at the election held on the 7th April, 1917.

39. Mr. D. S. Hanumantha Rao.
40. Mr. G. Girimaji Rao.
41. Mr. Veene Rangaswami Iyengar.
42. Mr. A. V. Nanjunda Setti.
43. Mr. Nadig Bhaskara Rao.
44. Mr. S. Venkataramayya.
45. Mr. S. Rama Rao.

Members of Central Committees.

46. Rao Bahadur M. Shama Rao, M.A.
47. Dr. M. Srinivasa Rao, M.A., M.D., &C., Sanitary Commissioner, and *Ex-officio* Director of Public Health Institute.
48. Mr. M. T. Narayana Iyengar, M.A.
49. Mr. A. K. Yegnanarayana Iyer, M.A.

50. Mr. C. Krishna Rao, B.A.
51. Mr. V. Subramanya Iyer, B.A., Secretary, Education Committee.
52. Mr. P. F. Bowring.
53. Sri K. D. Rukminiamma, B.A.
54. Mr. R. Gopalaswami Iyer.
55. Mr. T. Narasinga Rao.
56. Mr. H. Rangaswami Iyengar.
57. Mr. M. Subbiah, B.A.
58. Mr. T. K. Sundarajiengar.
59. Mr. N. Rama Rao, B.A., B.L., Secretary, Agricultural Committee.
60. Mr. C. Ranganatha Rao Saheb, B.A., B.L.
61. Mr. V. S. Sambasiva Iyer, B.Sc., L.C.E.
62. Rao Saheb M. Rama Rao.
63. Mr. M. N. Balaraj Urs, B.A., Secretary, Industries and Commerce Committee.

The Conference held its sittings on the 17th, 18th, 19th and 21st idems. There was no sitting on the 20th idem, that being the Birthday of His Highness the Maharaja of Mysore. The daily attendance ranged from 53 to 58.

Besides a number of visitors there were a few Indian ladies seated on the dais.

The President's Opening Speech.

Sir M. Visvesvaraya, the President, in opening the Proceedings, said:—

GENTLEMEN,—We meet once more in annual session to review the economic position of the country, correct errors and defects in our organization, revise programmes and arrange plans of work for the new year.

CONFERENCE WORK, PAST AND FUTURE.

The reports of the Chairmen of the three Central Committees explain in full detail the work done during the year. The Committees as well as the corresponding Departments of Government have suggested a large number of useful schemes some of which have been brought into operation.

The Industries and Commerce Department was reorganized and strengthened, and Commerce was constituted into a distinct branch under

the immediate direction of a separate officer. We have had the usual difficulties in procuring machinery but some progress is being made all the same. The manufacture of soap on a commercial scale has been commenced. A plant for the manufacture of lac dyes and varnish is being installed. A metal work factory has been started. A sum of Rs. 2½ lakhs has been advanced for private industrial enterprises.

The main subjects which received the attention of the Agricultural Committee during the year were the extension of fruit culture, development of sericulture, cattle and sheep breeding, use of better manures, forest and fuel plantations and the organization of rural credit. Leaflets were issued on tank repairs, scientific distribution of water for irrigation, well sinking, care of livestock, etc. A further impetus was given to elementary agricultural education and the question of establishing a Faculty of Agriculture in connection with the University also engaged attention.

In the field of education, we are making steady progress. If we are to judge by the demand for more schools and by the private contributions we are receiving, the country is hungry for education. The University is developing fast and on right lines. The Education Committee continued to give attention to the several schemes started at its instance, such as, the development of home industries, district, taluk and rural libraries, popular lectures in science and the Boy Scouts movement. Town libraries have been started in all the important headquarter towns. Attention is being paid to the education of the masses. Recently, a special grant of Rs. 50,000 was set apart exclusively for *Panchama* education.

Coming to Conference organization, we must admit that the 100 unit areas into which the State is divided are as yet imperfectly served by their Progress Committees. Further developments in the organization are needed for enlisting increased popular support and enthusiasm.

The Mysore District Committee has set a

good example in raising funds and has appointed, on its own initiative, a *Continuation Committee* for securing uninterrupted attention to its local wants.

A scheme has been sanctioned for associating as large a body of honorary workers with the Conference work as possible. Under this scheme, the co-operation of about 8,000 workers has been enlisted so far. The workers are of three grades corresponding to the three classes of Committees, the first class consisting of not less than 200 workers, the second 500 and the third 10,000. There is room in this organization for every public spirited citizen to lend a hand.

Among other matters which require special attention in the coming year are the development of minor industries, maintenance of correct statistics, arrangements for more frequent census of production and occupations and a permanent organization of honorary enumerators to supply statistics at short notice. If, by a special effort, interest could be roused in minor industries in the next few years, to the same extent that it has been in respect of education in the past, a very substantial step forward will have been taken in the economic development of rural areas.

Special attention is also needed to increase production. Within the past few months, the strain and pinch of the war have come closer to the everyday life of our people. The high prices of the necessities of life, partly due to the serious deficiency in food production in other parts of the world, are already causing serious distress. The situation requires anxious watching if we are to avoid a possible food famine in our midst.

OUR ECONOMIC POSITION.

After this brief reference to past year's work I will pass on to topics of more permanent interest. I shall first refer to the root defects of our economic position and the nature of the remedies which the situation calls for.

The Mysore State has an area of over 29,000 square miles and a population of about 6 million souls.

The following is a rough estimate of the wealth of Mysore :—

	Rs. Crores.
Land (7 million acres) ..	34
Irrigation tanks and canals ..	35
New irrigation works ..	3
Forests and Forest products ..	10
Minerals ..	35
Buildings, private ..	23
Buildings, public ..	3
Jewellery, Furniture, etc. ..	10
Domestic animals—cattle, sheep, poultry—Agricultural imple- ments ..	20
Railways ..	5
Roads ..	3
Electricity works ..	1
Water-supply and Drainage works ..	1
Merchandise ..	15
Banks, Joint-stock Companies, Co- operative Societies ..	2
Gold and silver coins ..	3
Total ..	203 crores or £135 millions.

The figures here given doubtless lend themselves to criticism. But if they elicit criticism, we shall have set people thinking and that will have quite served our purpose.

The above estimate gives a rate of Rs. 338 per head of population. The corresponding figures for the leading countries within the British Empire before the war were : United Kingdom Rs. 6,000 ; Canada Rs. 4,440, and Australia Rs. 3,960.

The annual agricultural production of the State was estimated in 1915 at about Rs. 14 crores and the industrial production at Rs. 4 crores, making a total of Rs. 18 crores, or an average production of Rs. 31 per head of the entire population. In good years like the present, with prices ruling high, this rate may go up to Rs. 37 or Rs. 40 per head. On the other hand, the average income in the countries mentioned above ranges from Rs. 500 to Rs. 720 per head.

The annual addition to the wealth of the United Kingdom before the war was estimated at £400 millions per annum. In Mysore it is doubtful whether we are making any appreciable addition to the wealth at all. For it takes several years for the country to recoup itself after a single year of scarcity. What is gained in good years of rainfall is used up in lean years.

The annual revenues of Mysore amount to about Rs. 3 crores. Those from taxation alone approximate to Rs. 2.5 crores, including salt and customs, giving a rate of Rs. 4 per head. The corresponding figures for taxation in the United Kingdom in 1913-14 came to Rs. 54 per head, in Canada Rs. 50 and in Australia Rs. 49.

The economic condition of a people is chiefly determined by the level of its education and the standard of its earning power. I have given the earning power. Education, we know, is also utterly inadequate, over 90 per cent of the population being illiterate. Our past history is thus a tale of uneconomic ideals, undeveloped resources, and untrained men and women.

UTILISING RESOURCES.

Our natural resources are fairly abundant. At present, we derive our food by the labour of our own people. With a little more effort, we should be able to supply nearly all the clothing we need, nearly all the head wear and foot wear, from our own factories and looms. More substantial houses will soon spring up in our villages if the people consent to forego some of their idle hours. With slightly more industry and better knowledge and thrift, every cultivator can lay by enough money or corn to tide over a couple of years of scarcity.

Our Agricultural Department has shown how production can be increased by 50 per cent in ten years. Remembering that about two-fifths of the agricultural produce of the country is from irrigation, it is easy, by scientific water regulation alone, to increase production under this head by about 30 per cent.

There is much mineral wealth which is hardly yet touched. The training of our people for this work has been neglected. Forest development is of recent growth and forest industries

are destined to play an important role in any scheme of future industrial development.

There are several waterfalls as yet unharnessed on account of the cost of the subsidiary storage required. Our village communications have just been taken in hand. Our railway mileage requires doubling.

Our greatest weakness is still in the industrial sphere which requires organization, capital and skill. Our surplus raw produce, instead of being exported in its crude state, might be worked up into manufactured products and sent abroad, in exchange for the imports we want and for the money which will add to our wealth.

Our aim should be to employ one-fifth to one-quarter of the population on industries and trade. Only by industry and trade carried on, on modern lines, can we hope to add to the country's wealth. No country can hope to become rich by agriculture alone, least of all ours with such uncertain rainfall.

TRAINING MEN AND WOMEN.

By far the greatest undeveloped resource of our country is its men and women. Instead of being at all times, as it should be, our most valuable asset, a great part of the population becomes a burden during years of scanty rainfall when agriculture, the only industry on which they depend, fails them. The value of a person's work to himself and to the country depends upon his skill, education and character. These do not come by nature. All three require training.

There should be provision for education, both literary and professional. General education is fairly well provided for already and, with a University at the top, there is no possibility of its being allowed to fall into neglect in future.

It is in respect of technical and professional education that there is still a great leeway to make up. Estimates should be prepared of the number of professional men which the country requires five years hence, and at intervals of every five years thereafter, corresponding to the growing activities of the country. We must

from now calculate and prepare estimates of the number of young men and women to be kept under training and make provision accordingly both in local and foreign educational institutions. These estimates should undergo systematic scrutiny at the hands of the Committee and the Department concerned twice a year.

Provision should also be made for short courses of professional training of, say, 6 to 8 weeks duration, for the benefit of the adult population engaged in industrial pursuits.

At least one *continuation school* should be started in each district for training youths to a profession from the 14th to the 18th year. The instruction may be in two grades corresponding to the secondary and primary grades of general education. Agriculture should be taught in every continuation school, also commerce and business, elementary engineering, such as, carpentry, smithy and house-building, as well as all crafts and industries commonly practised in the district or in the immediate neighbourhood of the school.

Education in business methods, business habits and business morals is a crying need of the country. These subjects should be included in the curricula of all high, middle and continuation schools.

The training of women for the professions requires to be specialised.

SPREADING SOUND ECONOMIC IDEAS.

For rapid industrial and commercial expansion, we should at once proceed to popularise sound up-to-date economic ideas and to eradicate many prevailing wrong notions and traditions. In the words of Lord Morley, we should take moonshine out of the heads of the people and put sunshine into their hearts.

The people should be trained in the correct methods and practices of organization by means of lectures and demonstrations. The spirit of co-operation should permeate every walk of life, every industry and trade. Associations, societies, leagues, clubs should be the rule for every profession. Co-operation or team work should be taught in schools as well as by public lectures, leaflets and newspapers.

Large concerns, that is, large factories, firms, banking organizations, etc., should be encouraged wherever possible in place of small ones; and corporate bodies should take the place of individualistic concerns. The most favourable form of financing industries is by joint-stock and partnership companies and co-operative societies.

In every occupation and industry, the application of science, scientific practices and methods and the use of machinery should be extended to the utmost limit permitted by circumstances.

Our people as a whole, particularly the agricultural population, should be trained to habits of ordered industry and thrift.

We should not be slow in adopting the new ideas and new practices which are coming into vogue as a result of the war. All these root ideas should soak into the minds and daily life of our people.

PREPARING TOWNS AND VILLAGES.

Our towns and villages should be suitably equipped for more rapid economic progress, by starting institutions and providing agencies needed for the purpose, after the example of the best developed towns in other parts of the world. If we are to give industry and trade its legitimate place in the economy of the State, we must lose no time to increase the town population by at least 50 per cent. Every town should have *extension areas* and *industrial suburbs* marked out, and maps and statements, duly approved, should be kept ready, to serve as a permanent invitation to intending settlers and prospective industrialists.

The chief institutions and agencies needed in a town are:—

- (1) A town hall.
- (2) A library and a reading room.
- (3) An Enquiry Office and Museum exhibiting samples of local agricultural and industrial products.
- (4) A Bank or Branch Bank of Mysore.
- (5) A branch Chamber of Commerce.
- (6) Associations for promoting special trades and industries.

(7) Co-operative Societies, both credit and non-credit.

(8) Co-operative Stores for the supply of seeds, manure, agricultural implements, etc., needed by the rural population.

(9) Continuation schools with classes for business training.

(10) Hotels and boarding houses for visitors, travellers and school children from out-stations.

(11) All the usual educational institutions from the high school to the primary school to accommodate at least 75 per cent of the local population of school age.

(12) A Vigilance Committee or Sub-Committee to keep up and stimulate economic activities.

In villages, again, we want a public meeting place, a reading room and library, co-operative societies, an inn or lodging house for travellers, village schools, etc. In future a Sub-Committee of the Village Panchayet or Improvement Committee and, in smaller villages, one of the prominent residents should be held responsible for giving continuous attention to the economic needs of the place.

TEAM WORK.

I have gone over fairly the whole field of development work which lies in front of us. The draft programmes of work for the new year are now before you. If, after the programmes are discussed and approved, each member of this assembly concentrated attention on some one item or groups of items and if our 8,000 allies in the districts were induced to do likewise in their respective spheres of work and if a goodly number of these honorary workers again acted each as a separate organizing centre, each to keep a large number of other workers similarly engaged, and if every member, associate, organizer, helper, worked at getting schemes developed, getting things done—worked away definitely, specifically and intensely—the aggregate sum total of Conference work in the coming twelve months would assume proportions which would astonish you. When once the habit of team work or co-operative effort

on this scale comes to be ingrained in the people, the country will be able to respond to any reasonable demands that may be made on it for the promotion of its material prosperity.

CONCLUSION.

I have often sought to invite attention to the low levels of exertion, low standards of earning and living which prevail in the country at present but from which our people have till now made no serious attempt to rise. The periodical famines have only intensified their helplessness. A Western writer refers to an occasion in his life when he had to record in his diary, day after day, the same words: "Got up, washed, went to bed." The diary of our whole people has been a similar record of dull routine. They have had no opportunities to solve large questions, no incentives to struggle against difficulties, no compulsory education, no conscription—nothing at all to lead them into habits of vigorous thinking and eventful living.

For the past seven years, we have, under the inspiration of His Highness the Maharaja, given prominence to the study of economic questions. We have made the people study, think and investigate. And by constant thinking and investigation, we have begun to realise the mistakes of the past, and the opportunities of the future. We should continue these studies; we should keep the lamp burning till all the dark corners of our economic household have been fully revealed, till the spirit of economic improvement has spread into every part of the country and entered into the daily life of every section of the population.

I had occasion, a couple of months ago, to inspect the District of Tumkur and, in the course of my enquiries into its economic condition, I was constantly reminded of the appalling fact that, in the great famine of 1877-78, the district lost nearly one-third of its population, presumably by starvation. One such fact is pregnant with lessons which should make our people think furiously. It should rouse officials and non-officials to instant and continuous effort till sufficient wealth is built up in the

districts, till a sufficient margin of staying power is created, that such a catastrophe on this God's earth shall not occur again.

CENTRAL COMMITTEE REPORTS.

At the conclusion of the opening speech, the President called upon the Secretaries of the three Central Committees to read the Reports of work done during the year 1917-18. Mr. V. Subramanya Iyer read the Report of the Education Committee; Mr. N. Rama Rao, the Report of the Agricultural Committee, and Mr. M. N. Balaraj Urs, the Report of the Industries and Commerce Committee.

Reports of work done by the District and Taluk Progress Committees were taken as read.

OBSERVATIONS BY MEMBERS.

The President then called upon the members to make observations, if any, on the various reports.

Rajasabhabhushana Diwan Bahadur K. P. Puttanna Chetty, C.I.E., then said:—

MR. PRESIDENT, LADIES AND GENTLEMEN,—
I need hardly say how glad we are to meet once again in this hall for discussing the economic condition of the country. This Conference was launched sometime before Sir M. Visvesvaraya was appointed the Dewan, but we all know that it was at his initiative that His Highness the Maharaja brought it into existence. I have consistently given my whole-hearted support to it from the very outset from the time when I was a Member of Council. I hope you will permit me to make a few general observations based on a survey of the work of the Conference for the past seven years. Nothing is easier than to find fault with the details which still remain to be elaborated and to condemn certain aspects of the scheme which I shall leave to the 'Candid Friend.' But I may say without fear of contradiction that the expenditure so far incurred is not barren of results. The Conference, if it has done nothing else, has served as the best means of educating the intelligent sections of the community in those matters which go to make up the economic prosperity of a people. The President has

referred to the work of the Conference past and future. This work has been mainly due to the systematic manner in which progressive ideas have been disseminated by means of the Conference Committees—Standing, Central, District and Taluk Committees. Critics have not been wanting who have held or expressed the opinion that the creation of so vast a number of Committees and Departments has led the average man to give up as hopeless the task of keeping himself informed as to what a tittle of them are doing. But it is easy to discern defects; much more easy than to evolve possible schemes of development. The war and the number of Committees it has called into existence in England and other advanced Western countries is, I think, the best justification of this Conference. In Europe they have found, or rather they are still finding, considerable difficulties in regard to meeting the complicated economic situation created by the disastrous war that has now been in progress for three years and more. In England they have brought into existence Committees and Sub-Committees innumerable for devising suitable schemes not only to meet the present difficulties but also to solve many future problems and provide for future contingencies consequent upon a return to normal conditions. True, we have had Committees composed for the greater part of persons who have not the necessary experience, knowledge or qualifications for dealing with the subjects referred to them. True, also to some extent, is the criticism we meet with that the findings of our Committees have been such as not always to command the general confidence of business and official experts. In my opinion this condemnation is probably too severe and certainly hasty; the fact that a body of responsible men drawn from all parts of the State and representatives of varied interests pass after due consideration resolutions on matters affecting the people is at least evidence of a widespread feeling of dissatisfaction with not only the existing condition of affairs but also with the methods pursued and the efforts made in the past for bettering them. Having said

this much, Gentlemen, I urge for more effective co-operation between the different Departments and Committees. The Conference has anticipated to some extent the difficulties that the war has brought to the surface. Its best justification is there. The fact that work more or less identical with that undertaken by this Conference is being done in the Western countries since the war commenced by special Committees as distinct from Departments is significant of the times. A Conference like this evolved out of the exigencies of our own position deserves to be put on a basis more satisfactory than the present one. After due deliberation I have come to think that the time has now arrived for His Highness's Government to seriously consider the question of making at least the essential parts of the organization of the Conference a permanent feature of the administration. For a beginning I would suggest that the organization may be kept up on the rupees three lakhs footing on which it has been worked for some years past. The work before us is immense. Competition will be more fierce after the war. The number of workers, thinkers and organizers has to be increased to an unlimited extent. More experts have to be created. Development works on a large scale have to be undertaken, whether in Education, Agriculture, Industries, Trade or Commerce. Every country in the world is now, despite the war and its pre-occupations, doing its level best to take stock of all its resources and the resources of other countries that may be available to it after peace has once been concluded. How are we to meet our own position? Should we or should we not have a suitable organization to meet our present and coming wants? To give effect even to a small part of the programme of work sketched out to us by the President, we want, I think, a sufficiently elastic organization to meet all possible conditions. Our work should be systematic, regular, all pervading and still definite in character and specific in operation. The President has brought out these facts clearly before us in the address which he has just delivered. War has added to the list of manufacturing nations; you

should remember that nations not previously reckoned as manufacturing people have seized the opportunity to develop their own industries to a degree not yet appreciated by us. The demand for raw products will be immense after the war and this country is sooner or later likely to be inundated by manufactured articles from many more countries than we have had to deal with in the past. This only shows that we have our own problems of construction and reconstruction and that we are likely to be left behind in the march of events if we do not take time by the forelock. It is open to us to utilise the existing organization and if necessary still further develop it and make every possible use of it to attain the ideals underlying this Conference. The time has now come to concentrate on more practical action and it rests with you to propose such modifications of the organization as will secure this result. I am sure that before I conclude I voice the sentiments of this assembly if we offer our congratulations to Mr. P. Raghavendra Rao on his well deserved elevation to the Council (Applause).

Mr. M. Subbiah then said :—Permit me, Sir, to say a few words on the address we have just heard. It is our privilege to get fresh hope and strength from you this day for another year's work and cold indeed must be the heart and dull the brain which is not kindled by the burning patriotism which inspires you. It is difficult to be critical, with your voice still ringing in one's ears and your enthusiasm throbbing in one's veins, but I shall try to touch a few of the more important activities initiated and pursued by the Conference during this year. As an agriculturist by profession and as a member of the Agricultural Committee it is only to be expected that I should lay most emphasis on the development of agriculture and the happiness and prosperity of millions who in Mysore as elsewhere are their country's pride and strength. You will pardon me, Sir, if, using Mr. Thompson's happy phrase on a previous occasion, I say, that the Agricultural Committee has been the "Cinderella of the Conference." The reasons are perhaps not far to seek. The Industrialist is apt to forget where he gets

his raw materials from and the pangs of hunger once appeased, people are apt to think little of the bounty which fed them. Agriculture has no home industries or factories and I dare say a lace or ribbon or the roar of machinery impresses the imagination more vividly than silent toil, which tills the earth and emulates her in patient spontaneity. The Agricultural Committee's interests are as wide as the State and as various as the crops which are raised, and the classes of men who raise them. The human material on which we have to make an impression is the most conservative part of the people engaged in one of the oldest industries known to mankind. Of course, there is a lack of pace in the movements. Had it been otherwise, we might well have doubted whether really all this mass was being moved. Work in this vast area is more comparable to rain which silently soaks into the soil making it yield its plenty than to the rushing cataract which turns the wheel of industry. Demosthenes said that the most important result of the statesman's work is in the hearts and minds of men, and judged by this standard the Conference has every reason to be proud of its achievements. The entire outlook of the people and especially of the raiyat population has changed notably in the past five years. There is not now very much of the abject dependence on Government for all things which formerly made the raiyat so helpless to work out his own salvation. He has, so to speak, consciously come into his man's heritage of being master of his fate and that realisation has made him bolder and more self-reliant. He feels that instead of being an inert pitiable charge on Government, he ought to be a helper in the duty of uplifting his country and in the amelioration of the condition of his fellowmen. He comes more frequently into contact with the agency of Government and his relations with officers are no longer characterised by fear and anxiety but by the mutual good will and respect which are the natural outcome of the intercourse of men at work on a worthy common object. Were there no other result, Sir, but this, the Conference would stand not only justified but glorified to all succeeding

generations. But even applying to it the usual test of material result we have not done badly. I shall deal more particularly with the work of the Agricultural Committee of which I am a member but also touch on one of the activities of the Education Committee with which I had the honor of co-operating. In agriculture, we have co-operated cordially with the Departments of Agriculture and Sericulture. We have strenuously pushed horticulture and developed the work considerably beyond our first hopes; we have studied the economic condition of the raiyat and attempted a solution of the difficulties which beset the path of his progress. We have worked out a scheme for relieving rural indebtedness and financing agricultural improvements. We have obtained for the raiyat concessions to encourage improvement of livestock and actually undertaken experiments to determine how best some kinds of livestock could be improved. We have studied how best the organization of agriculture which is the root of all progress could be improved and attempted to determine the scope of co-operative and other agencies. The details of the work done are given in the very interesting reports of the Committee and of the Departments concerned and it is unnecessary for me to enter on them here. It seems to me that the most important question on which the Education Committee are engaged is the one relating to scholarships for classes backward in education. I beg to offer a few suggestions regarding the concessions necessary to draw students from the rural areas to the University. No doubt primary education has been making very rapid progress, but higher education for rural population has not kept pace with it proportionately. The existing system of Lower Secondary Education does not afford reasonable facilities to students to continue their studies at the High School and the University. More particularly is this the case in regard to the students of the Kannada Lower Secondary Schools who are placed under a great disadvantage in the matter of study of the English language. At present these students study only Kannada in the Kannada Lower Secondary Schools and go up to the

Lower Secondary Examination in Kannada only. At this stage many students drop off as they think they have reached a kind of finality and feel disinclined to work for two years at the English language to pass the Lower Secondary Examination. This loss of two or three years is never made up even by those daring spirits who persevere and effectually cut off from the University the great majority of students from rural areas. This can only be prevented by making English a secondary language in all Kannada Lower Secondary Schools and making the teaching of English and Kannada a common feature of Kannada and English schools. This reform is urgently called for if English education is to spread uniformly in all parts of the State, rural as well as urban. This will enable mofussil students to stand on the same level as those in towns, and afford them the same easy access to higher education as is possessed by students in towns. This measure is of far reaching importance and will result in a material improvement in the conditions which are essential to real progress. Another handicap under which mofussil students suffer at present is the absence of boarding arrangement in connection with schools. This defect may be rectified urgently. At the outset there need not be any buildings built for Hostels. A beginning may be made in rented houses, one of the teachers looking after the arrangement with a small allowance. I do not think that this will cost more than Rs. 50,000 which is surely not much to pay for such a purpose. These measures are bound to produce a very marked expansion of education in the State. I therefore commend the suggestion to your kind consideration. As for the working of the Industries and Commerce Committee, Sir, I have very little to say. My honest opinion is that unless the Agricultural Department co-operates with the Department of Industries no progress is possible even though lakhs of rupees are spent upon it. What I mean is that industry is dependent on raw material and is to a large extent limited by the quantity of raw material produced in the country. If you have to purchase these things from outside, profits would

be largely problematical. I know, Sir, that praise is distasteful to you and so I keep back the words that come to me as I think of the vision which sees beyond the mist and smoke of contemporary controversies far into the future and the firmness which holds unswerving way to that goal undeterred by clamour and undaunted by opposition. Of a statesman who governed England in stormy times it is said that verily he was a strong man for hope shone in him as a pillar of fire when it had gone out in all others. We are passing through a crisis in the world's history and to us of limited vision the future is dark and full of menace, but we are confident in the love and wisdom of our Sovereign and the statesmanlike insight and capacity of his trusted Minister. We feel that the destinies of our country are in safe hands and that when distress and storm have passed we shall find that the position of Mysore as the Premier State in India has not only been maintained but improved.

Mr. M. Venkatakrishnayya observed that during the time of His Highness the late Chamaraja Wodeyar, the idea of combining non-official with official activities was first put forward. The Representative Assembly was the first fruit of this idea and an institution came into existence in which the officials and non-officials combined with one another to advance the prosperity of the State. In the Economic Conference and in a number of other institutions which have been brought into existence the opportunity to realise the wishes of His Highness the late Maharaja was fully availed of. A perusal of the Reports of the Conference showed that the object of the Representative Assembly and of the Economic Conference was more than realised chiefly due to mutual co-operation of officials and non-officials in attaining the results aimed at. The organization and methods of the Conference have now spread into the remotest areas in the State. In some of the Taluk Conferences many of the local wants were very fully considered and all those Conferences had become very useful appendages to the activities of the Economic Conference. The question of develop-

ing the resources of the State was now recognised as its primary duty. This idea took its first shape in the Mysore State. Even some of the Western countries were now proceeding on the same lines with regard to future economic development. Owing to the war and its pre-occupations it was a matter of regret that proper attempts could not be made in the direction of developing the resources of the State as there were difficulties in getting machinery. In the reports of the Central Committees there were a large number of suggestions made to develop the resources of the State. Attempts should be made to start industries which were likely to increase the wealth of the country. If a committee was appointed to work out the details of each of such industries he was confident that they would be able to provide suitable opportunities for remunerative work to a large number of people in the State. A lakh of rupees had already been given for promoting education among the backward classes. Government would do well to set apart Rs. 15,000, in order to give decent buildings for the location of schools and the backward classes themselves would supplement the Government grant by their labour and provide a large number of school-houses. It was not necessary to have splendid brick and mortar buildings. Ordinary houses with good ventilation would answer the purpose. Even in Western countries open air schools were advocated. In Mysore the Panchama Schools were rising to the level of schools for higher classes. In their modes of life the Panchama classes were manifesting a change for the better. Only a few boarding schools would not answer their purpose. The establishment of a large number of boarding schools would enable the Panchama classes in the course of the decade to uplift themselves from the low position in which they now found themselves. The scheme for providing the funds required for school building, by the municipal governments and enlisting private enterprise deserved to be adopted. If the Government advanced money at Savings Bank rates to intending builders there would be school buildings everywhere. With respect

to promotion of education among the depressed classes, help was required not only for education but in the matter of supplying materials such as books, slates, furniture, etc. The Economic Superintendents were doing a lot of good work in the districts and the Conference ought to strengthen their hands by allotting larger sums of money to help that work. It was gratifying to know that one High School has been brought into existence by the efforts of the local people helped by a munificent contribution from one of its public spirited citizens. There was abundant evidence to show that in their enthusiasm for education, people were prepared to make every sacrifice and demands upon Government would not be heavy. In some of the schools the school fee and Government grants were more than sufficient to maintain schools in a state of great efficiency. There were some schools in which the grant itself sufficed for the maintenance and the grant-in-aid code if revised on a liberal scale would certainly improve the efficiency of those schools. The high prices that had now been dislocating the condition of the society was a point to which special attention of Government must be devoted. In regard to the famine policy of the Government of India, the British Government laid down that not a single man should die of starvation. They should similarly see that not a single person in the Mysore State died of starvation. Some years ago an attempt had been made in Mysore to collect subscriptions and to purchase grain out of those subscriptions and to sell them at reasonable rates. They sold *ragi* at one anna a seer and in that way they tided over the difficulty of famine prices, and out of those subscriptions there was even now a credit balance of Rs. 3,000. In the present condition of high prices a similar attempt might be made to meet the difficulty. One of the statements made in a Committee's report consisted of a suggestion to give *takavi* loans to various kinds of activities including Printing Presses. Such a suggestion could not but command approbation of the Conference. If the Conference gave such facilities he was sure that not only the papers that now existed would flourish but a large num-

ber of very well conducted papers would receive help. In conclusion he suggested that the State might ask the Controller of Food-stuffs to stop the reckless export of produce from the State. In the words of Lord Morley, so aptly quoted by the President, much might be done to remove moonshine from the minds of people and introduce sunshine into their hearts and greater enlightenment and prosperity of the State could be made to result by earnest and continuous effort.

Mr. A. Ramanna observed that it was a matter for gratification that the Conference was in a way influencing the development of every section of the people. Education was progressing very rapidly and even the depressed classes were provided with facilities for education. Visual education was given to illiterate persons. A number of schools had been established in the State. In spite of extraordinary progress during the last five years, many felt impatient at the results. Mysore was pre-eminently an agricultural country and at all times food-stuffs would be a desideratum. To increase food-stuffs, a more or less large number of agriculturists in the country should be employed in agriculture. At the same time they must take care to educate them in such a way as to give them sound ideas regarding the dignity of labour and not make them forsake their avocations. He had himself, after a busy life at the bar, taken to agriculture and was more than ever convinced that the prosperity of the State depended upon the skill, contentment and the elevation of the agricultural classes. The efforts made in uplifting the backward classes socially, morally and educationally should be such as to cause no cleavage and in that onward march the higher classes should be taken forward along with the backward classes. The Economic Conference encouraged many people to take an interest in the economic condition of the people and since the institution of this Conference, he personally took great interest in the work of the institution and his own idea had become enlarged by his association with the Conference. Many of his dreams were now realised, such as, a University for

Mysore, the opening of the Arsikere Railway under what appeared to be the most adverse circumstances, etc. Though seven years have elapsed since the institution of the Economic Conference there still remained much to be done in the matter of consolidating their efforts in various directions. Some waste in expenditure was inevitable and they were also liable to commit some mistakes, but after sufficient experience had been gained, every item of expenditure would be able to show some useful result or other. What he would most strongly urge was that in future there should be systematic development on all sides. There was scope for further development of agriculture in innumerable directions. They had started a few industries, large sums of money had been invested in industrial and agricultural operations and people who invested money in such operations had got a fair return for their investment. The object of the Economic Conference ought to be to improve the economic condition and efficiency of all classes of people and not merely make the wealthy wealthier. The rise in the price of food-stuffs had given rise to a serious distress in the State. As regards the exports of food-stuffs from the State, the Economic Conference ought to take steps to prevent merchants from stocking produce and profiteering therefrom. *Ragi* was the staple food of the State and it was also the cheapest food. Attempts should be made to grow *ragi* on a larger scale and afford relief to the poorer people. Though he was against Co-operative Societies in the beginning he was now convinced of the benefits of co-operative action among the people and he recommended the establishment of Co-operative Grain Banks for the purchase of *ragi* at harvest times and the sale of the produce to poorer people at reasonable rates of profit. The State might invest a sum of about ten lakhs and might buy *ragi* at 18 seers and sell at 15 or 16 seers. The earning capacity of the people should be increased so as to enable them to meet the contingency of high prices of food-stuffs. In conclusion he observed that the Economic Conference was a great blessing for which the people of Mysore were grateful to His Highness

the Maharaja. He hoped that there would be a co-ordination of efforts in the various directions in which improvement was attempted and he appealed to the members and the people to show their loyalty to their Sovereign by attempting ceaselessly to bring about a fulfilment of the object which His Highness had in view in establishing the Economic Conference. He also desired to associate himself with the previous speakers in offering his congratulations to Mr. P. Raghavendra Rao as he had the pleasure of serving his father.

Mr. H. Krishna Sastri speaking in Kannada referred to some of the outstanding results achieved by the Conference. He observed that the people of Mysore had to congratulate the State on the establishment of the Mysore University. They had been able to take up such large industries as the distillation of sandalwood oil and manufacture of iron. He said that he would particularly urge that the present progressive policy be continued and that special attention be paid to the improvement of education in all the grades. In Shimoga and the *malnad* there was great scope for the development of industries and everywhere for the promotion of scientific and industrial education. Attempts should be made to publish science books in the Vernacular and the larger the expenditure the State incurred for that purpose the greater would be the result. Mahomedan education had made some progress but the question was whether the progress made so far was commensurate with the expenditure incurred. Some improvement also should be effected in the system of awarding scholarships to poor boys. If scholarships were not awarded to boys of a certain class for whom they were set apart such scholarships might be awarded to boys of other classes who applied for them. The condition of labourers in the State required to be remedied and the State should see that none of the labourers left the State boundaries for seeking means of livelihood elsewhere. There were about a thousand miles of railway and about 75,000 acres of irrigated lands available in the State and in those circumstances there was no

reason why Mysoreans should leave the State and seek means of livelihood elsewhere.

Mr. M. Shama Rao observed that the Economic Conference had enabled a number of men to take interest and study public questions relating to the welfare of the people and appreciate the difficulties that had to be overcome in realising the objects of the Conference. Difficulties in dealing with economic questions and putting forward schemes likely to be suitable solutions were too many. It was easy to criticise. At the same time it was very difficult to arrive at an agreement regarding big public questions. A very vague idea once prevailed regarding the real character of the economic questions and the relative functions of Government and the people. It was once considered that Government could do nothing towards the solution of economic questions. The points of view have now changed. Every one realised that economic questions should occupy the forefront of all public questions. Since the institution of the Economic Conference there had been a general awakening in the State with regard to economic matters and the public had come to be associated more largely with Government officials and both had taken part side by side in economic improvement.

Mr. H. Rangaswami Iyengar suggested that a more liberal policy should be followed in awarding the scholarships to deserving boys. The Conference ought to take some active steps in the matter of improving livestock in the State. The results of the Economic Conference have been of incalculable value to the State. The people of the State were indebted to His Highness the Maharaja and to the Dewan for establishing the Economic Conference and for their efforts to uplift the masses.

Mr. G. Girimaji Rao referred in appreciative terms to the useful character of the work done by the Conference and detailed the several schemes which had been brought into existence as a direct result of its activities. He offered some suggestions about the bringing about a better co-ordination of work between the central and mofussil agencies.

At this stage the Conference adjourned for lunch.

After Lunch.

Mr. K. Krishnamurthi Rao speaking in Kannada observed that the Economic Conference had now been in existence for seven years and yet on the whole it could not show any markedly important results. If the Conference had confined its attention to a limited number of important subjects from the very beginning it would have been able to promote the economic condition of the people to an appreciable extent. The Conference had a large establishment but the real work turned out was very little. The Economic Superintendents had done nothing beyond devoting attention to a few routine items of work. He did not suggest the abolition of the Economic Conference but only suggested that as far as possible efforts should be concentrated on specific items of work and there should be no duplication of activities. The Industries and Commerce Committee's report referred to expenditure incurred on some industries but nothing was said as to the progress made in the development of those industries. The report also said that aid had been given by the State to some industries but there was nothing to show the real financial position of these industries.

Mr. H. Krishna Sastri pointed out that the information asked for by Mr. Krishnamurthi Rao would involve disclosing of confidential matters. The subject may be taken up on the day reserved for confidential subjects.

On Mr. Krishnamurthi Rao's saying that there was no information as to how the resolutions passed at the previous Conferences had been disposed of, the Secretary, Economic Conference, pointed out that a complete list of subjects discussed at the Conference and the action taken had been published.

The President observed that Mr. Krishnamurthi Rao might ascertain from the Conference Secretary the details of progress made in the various industries for which State-aid had been given.

Mr. Krishnamurthi Rao continuing observed that the Mysore Bank though it was stated to have been started under the auspices of the Mysore State did not benefit the people of the State. There was no reason why varying amounts of travelling allowances were allotted for the various District Economic Superintendents when the nature of the work turned out by them was similar. Some Economic Superintendents found it possible to tour over a larger area without motor cycles and yet there were some Superintendents who did not tour over a wide area despite the supply of motor cycles to them.

He was, therefore, of opinion that the entire organization of the Conference should be thoroughly examined in the light of the experience gained and revised so that they may be able to show more substantial results in the future and check wasteful expenditure.

The President observed that Mr. Krishnamurthi Rao might discuss the question of making the Conference a permanent institution as the first subject on Wednesday morning.

IMPORTANT SUBJECTS DISCUSSED.

EDUCATION.

Mr. C. R. Reddy moved the following Propositions—

9. That in order to popularise and improve female education in the State this Conference considers the following measures necessary, viz. :—

- (a) The complete remodelling of women's education on the lines suggested by the Education Committee
- (i) by making vernacular the medium of instruction, and (ii) by recasting the curricula of studies to suit the needs of the Indian women by making English a compulsory second language.

Mr. C. R. Reddy said that in order to give effect to the proposition three steps were essential. There ought to be a provision made for a large number of Boarding Houses or Hostels so as to enable girls to proceed to higher education. The second point was the inclusion in the curriculum of studies of subjects which would be of practical interest and which would make girls good wives and wise mothers. The third point was to enable the largest amount of knowledge to be imbibed in the smallest amount of time and that could be done only with the vernacular as medium of instruction. Several persons of undoubted authority and acknowledged standing in the country recommended the vernacular as the proper medium of instruction. Dr. Sadler in writing a letter about the *Gurukula* observed that every young student, boy or girl, should be trained in the use of his or her mother tongue. In *Gurukula*, Science was taught through the vernacular. Prof. Jadunath Sirkar after a very lengthy review of the whole question as to the proper type of education in Bengal concluded that it was practically necessary to make Bengali the medium of teaching and examination in the schools and colleges. Mrs. Sarojini Naidu advocated a similar course. Mr. Shama Rao speaking at the celebration last year of the Maharaja's College Day said with undoubted authority that a better basis for the educational system of the State would be found by making the vernacular the medium of instruction. If that was the case with regard to the education of boys it must be regarded as even more important that it should be done with regard to the education of girls, because girls had to be withdrawn from schools much earlier than boys and it was doubtful whether in the present social condition of Indian girls it would be good to spend much of their time in acquiring mastery over a foreign language as a means of acquiring knowledge. The first need of education was that some taste for knowledge should be created and efforts should be made not to produce any sort of special excellence. Attempts should be made on the other hand to give girls as much objective knowledge as possible and that could

be done only with the vernacular as the medium inasmuch as the mother tongue would give the minimum amount of strain.

Mr. Mir Humza Hussain seconded the proposition and said that his reasons for supporting the proposition were given in a note printed on page 2 of Part II of the Education Committee's report. The scheme advocated in the proposition was not new. It had been advocated by no less an authority than Prof. Karve of Poona. The leading gentlemen of Mysore agreed with the Professor when he delivered a lecture at the Rangacharlu Memorial Hall on the subject. Education through a foreign tongue denationalised the people. It made people get into the habit of thinking in a foreign tongue and in a foreign manner and was not conducive to the advancement of learning, to research and to the betterment of the people. Sterility of Indians in the field of original thinking was due to the fact that most of them had to spend the best part of their lives in thinking in a foreign language. When that was the case with regard to Indian boys why should they extend the system to girls and denationalise that sex, also? The educational system for girls ought to take account of the peculiar social condition of the Indian women. Time had not yet come in India for women to enter the civil service or to take part in business organizations. What was needed of Indian women was to become good wives and wise mothers.

The President observed that the ideal was much higher than that in the West.

Mr. Humza Hussain continuing observed that India was still in the infancy of advancement. The system of education here ought to be based on the peculiar conditions of the lives of women and such a system would ultimately bring out the best part of womanhood. In America it was considered that the proper system of University Education was one which would fit boys for the practical duties of life, and the curricula of studies in the Universities had accordingly been modelled on that principle. The Vice-Chancellor of the Mysore University was in favour of remodelling the course of the education for women and perhaps the best course for

them was to get the Mysore University to establish a separate degree for women.

Mrs. Rukminiamma in opposing the proposition said :—I beg to oppose the proposition on the following grounds. The proposition for the complete remodelling of women's education making vernacular the medium of instruction aims at three objects.—

Firstly, lowering the standard of women's education, especially English, so that higher education might spread more rapidly or widely among girls in general; secondly, shortening the courses of study in the higher grades, so that it may be possible to make graduates of our girls before they leave off schools; thirdly, confining women's education to the study of what may be called for want of a better term, domestic subjects.

The reasons alleged for this drastic change are :—

Firstly, that our present social conditions do not permit our girls reaching, in larger numbers than at present, the high standard of English education provided for them in our schools and colleges.

Secondly, that English is of no practical utility to our women.

And thirdly, that marriage and motherhood being the goal of our girls, their educational system should be so altered and framed as to train them up to be "good wives and wise mothers."

Let me examine these arguments in detail.

The problem of women's education was just now subjected to a very careful analysis by one of our eminent educationists and the root of the trouble was correctly spotted to be the baneful custom of early marriage which has been acting as the chief hindrance to our girls pursuing higher education. If it is conceded that education is as much the birthright of man as of woman—and I believe no body will be foolhardy enough to gainsay it in the present age—then the surest and the speediest remedy lies not so much in remodelling the present system of education which is not at fault, but in getting rid of our social evils by a single Act of our Legislature, if that were only possible.

But unfortunately for us in Mysore, social reforms have not kept pace with our educational achievements and aspirations. The pioneers of women's education here seem to me to have begun to work at the wrong end unlike their brethren of Bombay, where intellectual and social progress among women has taken such great strides. This is because the men of Maharashtra who are above all a highly practical people have successfully solved their social problems. Whereas they can count their girl students by hundreds, we cannot do so here even by tens. But it reflects the highest credit upon the pioneer workers in Mysore that, in spite of social obstacles, they have met with such a good measure of success of which they may well be proud. With such hindrances out of the way, there is no reason to doubt that education among women will progress by leaps and bounds.

Apropos of social reforms, conditions here are much better now than what they were some twenty years ago. Our women are just awakening to a sense of their lost social position, and have been struggling for self-expression after centuries of forced repression, and it is just the time when such experiments of doubtful utility and radical changes of a far-reaching character, as the proposition before us contemplates, are most unwelcome. At any rate speaking on behalf of women I may say that we do not hail them with joy whatever opinion to the contrary may prevail in other quarters.

In this connection one section of the Hindu community has a claim on our notice. I refer to the Hindu widows. They can be educated to any age and to any academic standard, however difficult it may be, as they have the time and the leisure for it. There is a great need now-a-days for women teachers in our various girls' schools and for nurses and lady doctors in our hospitals. They are in a minority no doubt and that in itself is a very strong reason why greater facilities should be created to educate them, so that their services may be employed more largely than at present for the benefit of their backward sisters.

Again, it is not all Hindu communities that

enforce early marriage. Far from it among the so-called backward communities marriage is as much optional to women as to men. Our benign Government offers liberal encouragement to all communities irrespective of caste distinctions and we may reasonably expect girls of the backward communities to come forward in larger numbers to avail themselves of higher education.

Secondly, it is urged that a knowledge of English is of no practical utility to our women, and a few even go the length of remarking that the mental strain consequent on a study of it is not conducive to the health of girls.

If by "practical utility" is meant making use of a knowledge of English to earn money then I fully admit that our women in general need not receive any English education, for, the idea of the economic independence of women is new to the Indian mind. But it is admitted that pure intellectual culture cannot bear a commercial valuation. For the sake of argument it may be asked:—"Do boys turn into account all that they learn during their careers as students? If not, on what grounds can we justify the existence in their curricula, of subjects, a knowledge of which they cannot turn into any practical use involving a monetary benefit to them?" The proper answer to this query seems to me to be, that a knowledge of such subjects has a cultural value of its own, apart from any practical utility to be derived therefrom. Provided our girls show a capacity to learn English and to grasp new ideas, I fail to see any reason why they should be denied this kind of intellectual culture.

Besides there is another very strong argument in favour of our girls receiving English education. Our ideas of progress, constitutional liberty, and nationality are all to be traced directly to the English education we have received. If women are to play any prominent part in the formation of that United India the realisation of which has been made possible by a wide diffusion of a knowledge of the English language, it is absolutely necessary that English should be given the chief place in our system of education. We speak with high respect

and admiration of Mrs. Sarojini Naidu, Srimati Sarala Devi Choudhurani, Mrs. Ramabhai Ranade—to name only a few of the foremost Indian ladies of rank, culture and enlightenment. Surely they would never have been heard of but for their English education.

As for the fear that severe mental strain is not conducive to the health of the gentler sex, I contend it is thoroughly unfounded, as can be testified to by scores of our school girls, who are a standing defiance of the hollowness of this assumption. If there are any exceptions the causes are to be sought for elsewhere, chiefly perhaps, in their neglect of physical exercise.

As regards the third argument against the present system of women's education, *viz.*, that the present curricula of studies have not been framed to suit the special needs and requirements of Indian girls, it is argued that as the home is the centre of women's activities, their education should consist exclusively of the study of domestic subjects, like cookery, laundry, domestic economy, etc.

This is what I may term for want of a better phrase, the domestic ideal of women's education, a very ancient ideal no doubt! It may satisfy men but not women educated on modern lines. As this ideal urges upon us the necessity to train our girls to become "good wives and wise mothers," it may reasonably be asked what attempts, if any, are proposed to be made in our schools and colleges to train our boys to become "good husbands and wise parents." To be sure, higher education means something more than aiming at domestic felicity on the part of both boys and girls. However much we may fall short in our achievement, our ideals must be of the loftiest. Our women should be given a freedom of choice as regards their ideal of education. Each individual, be he man or woman, is to be regarded as a soul to be developed in strict accordance with individual aptitudes without distinction of caste, creed, colour or sex.

In this industrial and domestic era, nobody, not even the most confirmed Anti-women Educationists, would wish back the age of the *Rishis* when men and women lived in forests primeval,

at peace with God and man—the men searching after truth and the women looking after the domestic comforts of their husbands. Such a state of things would be quite unsupportable amidst modern conditions and surroundings. The struggle for existence is getting keener and keener day by day, and men and women alike should put their shoulder to the wheel unless they wish to be trampled upon and crushed by other more progressive nations. The domestic ideal of education need not be given any undue preeminence in any system of education for our girls, as they get a knowledge of cooking and house management almost as if by instinct, aided by the atmosphere of their homes and the training received therein. What they want more than anything else is intellectual culture which alone can give them that courage and self-confidence without which no one can get on in this world.

Now coming to the main point of the proposition, I fail to see how the substitution of the vernacular as the medium of instruction in the higher grades of study would help to diffuse learning widely or rapidly among girls in general who leave off school at the age of 12 or 13, unless the standard of the so-called higher courses is considerably reduced, in which case it does not deserve to be called higher education at all. Moreover, I may point out, that in prescribing courses of study, the age of the students is one of the most important factors to be considered. Primary, Elementary, Secondary and Collegiate Courses of study have special references to different stages of progress. It is in recognition of this principle that an age-limit of 15 is fixed for the Secondary School Leaving Certificate Grade. How can girls be made to complete Secondary education before they leave off school which they do at 12 or 13, unless the standard is very, very, low? Supposing they do complete it, are girls of such tender age fit to join the Collegiate Course? For the sake of argument, it is immaterial whether they are considered fit or not, as it is presumed that they drop off at that age. It may reasonably be asked why the standard of education should be lowered if it does not help us an inch further

than where we stand at present. The utmost that can be hoped for from this drastic change is to send our girls out very poorly equipped with general culture of the Secondary grade without at the same time taking care to ensure a larger or even a steadier supply of girls to the Collegiate courses of study. In the meantime such of the girls as have the capacity, the willingness and the convenience to benefit by higher education are deprived of the opportunity to attain to the highest standard of academic excellence. The standard of higher education should not be lowered under the mistaken notion that it will gain greater popularity and confidence. Social progress is the one indispensable condition for the general spread of the higher education among women and it is futile to attempt to hasten it by means of lowering the present standard.

Taking the merits of the proposal into consideration it may be a good ideal to strive after and to give prominence to vernaculars, but it is not practicable at present for want of suitable text-books, not to say anything of books of reference. It may be argued that a larger demand would create a more adequate supply. But I would point out, that our Upper Secondary Course, where teaching is carried on purely in the vernacular, has been in existence for ever so long, and there has not yet been produced a single good text-book of History, Geography, Science or Mathematics. It will take a very long time before this initial difficulty is overcome. If the vernacular is really to be made popular, it is to be done not at the expense of English but by other means, as, for instance, by an improvement in the prospects of our Kannada teachers, pandits and vidwans, and by an offer of liberal patronage to Kannada authors.

Finally, I may observe, the experiment of the vernacular as the medium of instruction, has been tried in our Upper Secondary Course, the results so far achieved being far from satisfactory. The experience gained in this direction does not justify us in making such a radical alteration in our present system of instruction for girls when the end in view is not likely to be achieved.

If, on grounds other than educational, the change is urged, it is but right that the new principle should first be introduced into the system of education for boys, or let it be simultaneously tried in the case of both boys and girls so that they may stand or fall together.

With these observations, I beg not only to oppose the proposition, but also to protest against its probable introduction into the present system of education for girls only as unjust and unfair.

Mr. M. Subbiah observed that the President at a previous session of the Representative Assembly objected to members speaking in Kannada. Unless the State made Kannada a language of the University and of the Government they could not insist upon making the vernacular the medium of instruction for women. Education was intended to promote culture of both men and women and what was culture for men was also culture for women.

Mr. A. Ramanna observed that the difficulty of the question consisted in the applicability of the system to the conditions that prevailed in Indian society. He proceeded upon the hypothesis that all education was necessary to bring about happiness. The question for their consideration was what kind of education was likely to result in happiness. What would an English lady in England say if she was asked to attain a high degree of proficiency in the Spanish language? The conditions of women in Mysore ought to guide them in evolving a system of education suited to their condition. English was a foreign language to Indians, but some knowledge of English was indispensable in the present day, but there was no need for an academic knowledge in English for women to the same extent as it was necessary for men. The scheme of education suited to Indian women ought to be such as would enable women to be good wives and wise mothers, so as to bring about domestic happiness. That kind of education which did not result in ensuring domestic happiness was no education at all.

Mr. M. Venkatakrishnayya in opposing the proposition said that at present there were not

suitable text-books in the vernacular capable of imparting higher education to women. In Japan for thirty years a large proportion of the revenues of the State was utilised in getting books translated into the Japanese language. His experience of girls as well as boys was that Indian girls took to English far better than boys did. In English High Schools there was no need to introduce the vernacular as the medium of instruction. Adequate facilities did not exist for the teaching of Science, Philosophy, etc., through the medium of vernacular.

Mr. K. Chandy opposed the proposition and observed that they had to work along lines which would make some progress. At present in his opinion English education would make for progress.

Mr. M. Basavayya observed that the important point for consideration was whether for the generality of girls, education should be through the vernacular or through English. In his opinion English was most unsuited to the generality of women. Though the college for women in Mysore had now existed for 15 years an appreciable number of women graduates had not passed out in the State, despite the award of liberal scholarships and the existence of a costly college.

Mr. A. K. Yegnanarayana Iyer said that there was nothing to prevent girls from taking English as a second language. There was no reason why in the University Standard women should not specialise in English. If proper encouragement was given by the State and the Education Department, suitable text-books in the vernacular could be produced within a reasonable time.

Mr. P. A. Barton observed that there was no reason why the benefits of education given to boys ought to be denied to girls and the question resolved itself into one of facilities for the best form of development.

Rao Bahadur M. Shama Rao congratulated Mrs. Rukminiamma on the able manner in which she had pleaded for English education for women. But he said that he knew that several women were opposed to English being the medium of instruction to girls. He was of

opinion that the progress of education would not be as rapid with English as medium of instruction as it would be if the vernacular were the medium. It was true that a sufficient number of books were not translated into the vernacular but that was due to the fact that sufficient encouragement had not been afforded to attain that object. He saw no reason why culture could not be communicated through the medium of vernacular education. If University education was to develop with English as the medium of instruction it would take several years before education would progress among women. He did not believe that an act of legislature would put an end to early marriages which were brought about by a long-standing custom. If higher education spread amongst women, pernicious social evils would disappear in a few years. In the case of women belonging to agricultural classes vernacular education would be of great value. Even under the new scheme proposed in the proposition there was nothing to prevent women from taking English as a compulsory second language. The object of the proposition was to make vernacular the medium of instruction for the majority of women.

Mr. C. S. Balasundaram Iyer observed that what was wanted was education on modern lines. If Western knowledge was the chief repository of scientific culture and if a knowledge of the English language had been the sole means of getting access to that repository and had been so for a long time for all scientific culture, English ought to be the medium of instruction. But now that they had a fairly large number of competent men to translate that culture into vernacular they should try to take one step further and disseminate culture among women as widely as possible. With fifty years of English education they had barely touched 1 per cent of the population. Many centuries would elapse before the whole population was educated. There were difficulties in introducing changes to suit the social conditions but if they introduced some changes in the manner suggested in the proposition there would be a gradual development. They

must make a determined effort in the direction of producing suitable text-books in Kannada and if they did so in the course of a few years they would create a body of literature quite appreciable in size which would spread culture in the whole land. The question was to be tackled both as regards the education of boys as well as girls. Nobody argued for the displacement of English altogether by the vernacular. All that was aimed was that boys and girls must have a working knowledge of English. What was wanted was books imparting culture. This did not mean that the sole medium of culture should be English.

Mr. M. A. Narayana Iyengar observed that they were making too much of a very simple matter. The controversy had arisen chiefly because of a confusion of ideas. They were not going to abolish English education nor were they going to abolish the vernaculars. But all that was meant was that vernaculars would be more suitable for the generality of women. They all admitted that women were half of mankind, the better part of men. The more important question should be the creation of such facilities for women's education that they might push it up in the best possible direction. Could they supply at least 50 women teachers? Could they give them 1,000 scholarships for 1,000 scholars to continue their education from the ages of 12 to 16? Those were crucial tests for the promotion of education. They could get now a certain number of women as teachers from the Christian community but that would not do. If they were prepared to give liberal scholarships to at least 1,000 girls to continue their education between the ages of 12 and 16 they would have solved some portion of the problem. The difficult portion of the problem related to the removal of social disabilities and putting off the marriageable age of girls and unless those difficulties were removed they would not have tackled any portion of the problem. Something had already been done for the depressed classes. What had they done for women? Were they prepared to grant Rs. 200,000 immediately for the promotion of female education? The period

between the ages of 12 and 15 of girls was the period in which they must do their best to create a career for girls and if they did so the problem would be solved to a great extent. Until that was done the introduction of vernacular education was of secondary importance. Out of 1,800 schools that existed last year there were only 34 girls' schools. He pleaded for larger allotment of funds for women's education.

Mr. C. Krishna Rao observed that facts of History, Geography or Science were not learnt differently through the vernaculars. Since they could be learnt through the vernacular much more correctly and much more easily, more time would be liberated for the study of English; and English, whether as optional or compulsory subject, would receive more attention. He, therefore, heartily supported the proposition.

Mr. K. Krishnamurthi Rao supported the proposition and observed that Mysore was a Kannada country and though they had 50 years of English education for women there was not much progress in female education.

Mr. C. R. Reddy in replying to the observations of those who had opposed his proposition first congratulated Mrs. Rukminiamma heartily on the splendid speech in which she pleaded for English education for women with extraordinary ability and cogency of argument. If he differed at all from her argument he took the entire blame on himself on the ground that he had not made his position with regard to the proposition sufficiently clear or had not developed it in any detail. He was under the impression that the notes and memorandum appended to the Education Committee's report on this subject were clear enough but evidently those papers did not seem to have been studied with the care that they deserved. What he wished to make clear was that there had been a slight misunderstanding due to the fact that the proposal to make vernacular the medium of instruction was understood to mean that they would banish English from schools. That was not a correct understanding of the proposal. English was to be a compulsory

second language. In all the higher portion of studies a large number of subjects were provided as optionals and there was nothing in the scheme to prevent English appearing as one of the optional subjects to be taken by people who had aptitude for literary pursuits. There seemed to have been a quiet equation established between English progress and culture and all that was included in modern education. It was true that a good deal of progress in India was due to English education but that progress was not due to English as language, but to feelings and sentiments communicated to them through English and there was nothing to prevent those feelings and sentiments being communicated through the vernacular. He did not admit that the salvation of any people depended on the cultivation of culture in any particular language. They might look at nations which had had progress and culture. Had England progressed through French or France through English? Had not Japan progressed by confining itself to its own language? If so, could not the same thing be done with their vernaculars? If to-day he were given Rs. 20,000, within two years he would produce text-books in the vernacular. Telugu had done it and Bengali had done it. Why should Kannada not do it? A distressful argument had been put forward that if men in sufficient numbers were not available as teachers there were widows who could be trained as teachers in girls' schools. That argument was not a happy one because to make English education for women depend on the existence of a social evil would be to perpetuate that evil and not to take steps to put a stop to it. Before he formulated these proposals he had consulted a large number of ladies and a large majority of them were in favour of this proposal. Mrs. Sarojini Naidu's speech which Mrs. Rukminamma quoted was in favour of his proposal. Mrs. Sarla Devi Choudirani, a member of Prof. Karve's Women's University was also an advocate of women's education through the medium of vernacular. Mrs. Rukminamma appealed to Cæsar and let Cæsar answer. The Maharashtra had gone in largely for vernacular edu-

cation among women and that was their model for formulating the methods of female education.

The first clause of the proposition that vernacular be the medium of instruction for women's education was then put to vote and carried by a majority.

The second clause that the curricula be recast to suit the needs of Indian women, English being taken as a compulsory second language was next put to vote and carried by a majority.

At this stage the Conference adjourned till 12 noon next day.

SECOND DAY'S PROCEEDINGS.

TUESDAY, 18TH JUNE.

THE Conference resumed its sitting at 12 noon on the 18th June.

Industries and Commerce Subjects.

Mr. V. S. Sambasiva Iyer moved the following Proposition :—

1. The Conference is of opinion that with a view to developing industries suited to local conditions and from materials available locally and also to encouraging local manufacture as far as possible, the following measures should be taken at an early date :—

(a) Arrangements should be made to institute a thorough enquiry into the raw materials and commodities available in the State under the following categories :—

- (i) materials of which the requirements of the State are approximately equalled by State production,
- (ii) materials mainly or wholly produced within the State, which

are at present chiefly utilised for outside requirements,

- (iii) possibilities of new sources of supply, and
- (iv) possibilities of producing substitutes within the State.

In doing so he said that his suggestion mainly was that they should pay special attention to obtaining estimates of quantities of raw materials available in the State and also of products manufactured therefrom with a view to gain correct information as to the directions in which further commercial and industrial development should be undertaken. They had no complete data with regard to any industry now nor as to the quality or quantity of raw materials available. There were products manufactured from raw materials available in the State and even for those products they had not complete returns. There were resources in power, such as various waterfalls, small and large, there was wind-power, and there was also manpower, brains and money as well as trained mechanical intelligence and capacity which needed organizing.

Mr. Sambasiva Iyer (continuing) observed that it might be that there were some products of which they were not aware. No doubt a certain amount of information had been collected and a good deal of investigation work had been done and results published in the shape of bulletins. There were several kinds of raw materials which were not properly utilized. He had taken some trouble in collecting a certain amount of information for the industrial survey of Mysore but all this had to be further investigated and supplemented and brought up-to-date and correct data regarding the scope for industrial advancement in various directions should be made available. For that work he proposed that a special officer be appointed and he estimated that the special officer would be able to do the work in a year at a cost of Rs. 25,000.

Mr. S. G. Forbes pointed out that the Committee was taking very active steps in ascertaining the quantity of mineral and forest resources available. A survey of the Gersoppa

Falls was also being made and others would be taken up as funds became available.

The President observed that he understood that similar enquiries were being made in other countries with a view to strengthen their economic position after the war. The Industries and Commerce Committee and the Commercial section might take up the subject and prepare a scheme regarding the investigations to be made to furnish people in the State with information that would enable them to start new industries.

Mr. B. Jayaram read a memorandum showing the necessity for investigations of all and such raw materials available in the State as are of economic and industrial importance. He said that the memorandum contained an exhaustive list of minerals that might be taken up for investigation.

Mr. S. G. Forbes said that it was also necessary to ascertain the quantity and quality available of materials such as graphite, limestone, etc.

The President said that the subject would receive special attention in the coming year by the Industries and Commerce Committee and the Geological Department.

Mr. M. L. Vardhamaniah moved the following Proposition.

1. (b) The several Departments of Government should be requested to publish lists of articles required by them annually for Government use, their qualities, rates, etc., to enable local manufacturers to enter into contracts with the Departments for the supply of indigenous articles manufactured by them in preference to the importing of foreign goods; and a Committee should be appointed to deal with the grant of all large contracts and give preference to the local people.

(c) The establishment of a Central Stores so that all the orders for the various Departmental requisites be sent to the stores only instead of being placed directly with the manufacturers.

The mover said that a Government Order had been issued on the subject but it was not strictly enforced. He was of opinion that unless a Central Stores was organized to supply the requirements of all the Departments and a Committee dealt with all orders and tenders for purchase on a large scale it would be impossible to prevent irregularities as the Heads of Departments were compelled to leave such matters to subordinates. An organization of the kind moreover would greatly facilitate economy in purchasing.

Mr. V. Rangaswami Iyengar said that if the mover had been watching the Gazette he would have seen what action had been taken. Tenders were called for by public advertisements published in the Gazette.

Mr. M. L. Vardhamaniah said that certain tenders had been refused.

The President pointed out that there might be certain difficulties felt by the Departments and said that if the mover would confidentially bring to the notice of the authorities cases in which the Government Order had not been observed such cases would be considered.

Mr. K. Krishnamurthi Rao suggested that a list of approved contractors might be made out and tenders invited only from them.

Mr. V. Rangaswami Iyengar said that there was such a list of approved contractors.

The President said that he sympathised with both parties. In the Public Works Department all contracts were being given to local men.

Mr. V. Rangaswami Iyengar said that if Mr. Vardhamaniah would go to his office he would explain to him how his Department got the articles required by it.

Mr. S. G. Forbes also said that he had no objection to any member of the Conference coming to his office and examining how the Department conducted its business.

Mr. K. Krishnamurthi Rao said that if transactions were made openly with contractors there would be no complaint. Tenders would be called for but no one knew on what principle they were disposed of. The better

plan would be to send for all the approved contractors and get the most favourable rates in open competition. Last year he brought to the notice of the Conference certain irregularities with reference to municipal contracts. But owing to want of time the subject was not fully discussed.

Mr. H. Krishna Sastri also supported the proposition and pointed out that there was a large number of articles to be supplied to the various Departments of the State and that if some attention was paid to devising a proper organization to meet the demands as far as possible from local resources it would stimulate local trade. No harm would result from the appointment of a Committee.

The President observed that there were so many departments which were in need of stores that there would be difficulties in having a central organization and they were following in Mysore the course adopted in British India.

Mr. M. L. Vardhamaniah said that his idea was that a Central Stores should be created and the special officer in charge of that Department should be asked to supply the articles required by Departments.

The President said that such a scheme might create discontent among merchants. There was no reason why there should be less abuse under the new system than that in which the functions were left to the heads of the various departments concerned.

Mr. A. Ramanna enquired what became of the discount that was given when purchases were not made on credit.

Mr. J. S. Chakravarti said that wherever discount is allowed it is credited to Government.

Mr. A. Ramanna asked if there was anything on record to show what percentage of discount was allowed.

Mr. J. S. Chakravarti replied that it was only the net amount that was shown in the bill.

Mr. P. A. Barton observed that the point was whether in the acceptance of these tenders the Heads of Departments exercised their discretion themselves or left the business to clerks. He was not accusing Government of any negli-

gence. If the public, however, had an assurance that the disposal of all contracts was determined by Heads of Departments there would be no complaint.

Mr. K. Matthan suggested the desirability of having a Central Purchasing Department.

Mr. M. L. Vardhamaniah said that even the Government of India contemplated the starting of Central Stores.

The President observed that each Department would understand its requirements better than the Central Stores. Unless they had a huge establishment they would not be able to test the requirements of the various Departments. If Mr. Vardhamaniah would study the question thoroughly and put forward reasonable suggestions Government would be prepared to consider them. Meanwhile there were Government Orders bearing on the question which afforded reasonable protection to local enterprise.

Mr. M. Chengiah Chetty moved the following Proposition :—

1. (d) That having regard to the difficulties that exist at present in obtaining machinery for starting new industries and the abnormal conditions which may be expected to prevail for several years more, a thorough investigation be made as to the best means of developing industries in the State, of increasing the manufacture of articles the import of which has decreased and also of expanding the market for Mysore goods.

Mr. P. G. D'Souza observed that some action was being taken in the manner suggested in the proposition.

Mr. M. Chengiah Chetty said that he did not know of any action having been taken and that in his opinion a thorough investigation was necessary.

The President inquired of Mr. Chengiah Chetty why he did not induce the Chamber of Commerce to take up the subject. He however said that the Conference Secretary would note the suggestion.

Large Industries.

Mr. V. Rangaswami Iyengar moved the following Proposition :—

2. This Conference recommends that as there is sufficient scope for the establishment of the following large industries in the State which are likely to prove profitable, they may be started either as private concerns if sufficient capital is forthcoming, or as concerns financed by Government.—

- (c) Manufacture of stoneware pipes out of the abundant raw material available in the vicinity of Bangalore in view of the fact that the drainage scheme for the city of Bangalore had to be taken in hand shortly and rupees ten lakhs worth of stoneware pipes would be required.
- (d) One large sugar manufactory on up-to-date lines.
- (e) A small rolling mill for the manufacture of ordinary commercial bars from scrap-iron as is done in Pondicherry.

The mover said that if the manufacture of stoneware pipes was undertaken now, there would be work in meeting the requirements of the drainage schemes at least sufficient for the next seven years. The total cost of machinery would be about a lakh of rupees. There would be continuous flow of money from the Public Works Department. As regards sugar manufactory he had seen the factory at Nellikuppam in South Arcot District. There a private company was able to get lands on lease for 25 years and the whole area was relaid in small blocks. The company had taken 1,500 acres on lease for sugar-cane cultivation. Another area of 3,000 to 4,000 acres was under cultivation by raiyats. The whole arrangement was working very satisfactorily and he ascertained that the cost of the scheme was about Rs. 10,00,000. The Chief Engineer in Mysore might be able to give some information

on the question of the availability of the land for sugar-cane plantation.

The President observed that the scheme required a great deal of investigation before recommendations could be made to this Conference and he said that the matter would receive the attention of the Committee and the Department.

Mr. V. Rangaswami Iyengar (continuing) observed that there was a dearth of iron in the Mysore market. There was a great scope for putting up rolling mills in the State. He had seen a rolling mill established at Pondicherry and he believed that a similar mill might be established in Mysore. He estimated the cost at between rupees fifty thousand and one lakh of rupees.

Mr. H. Subba Rao moved the following Proposition :—

A Cotton Mill be established at Davangere.

He said that the comparative merits of Davangere and Harihar for the location of the mill had been considered from several points of view. Firstly, with regard to the availability of raw material; secondly, the supply of labour; and thirdly, the possibility of raising a fair proportion of the capital required for the venture; fourthly, the water-supply; and fifthly, the power and fuel. It was finally decided that Davangere was more suitable than Harihar. Davangere was the chief cotton exporting centre in the Mysore State. Forty thousand bales of cotton worth about 120 lakhs of rupees were exported from the place every year. There were ten ginning and four pressing factories there. As regards labour, Davangere possessed a positive advantage in that its labourers were accustomed to handle machinery in the local ginning and pressing factories. There were two thousand professional but unskilled labourers. Even with regard to the possibility of raising a fair portion of the capital Davangere occupied the first rank in the Province. It might not be difficult to raise locally a fair portion of the capital of about twenty lakhs of rupees provided the safety of the investment was assured by the Government guaranteeing a reasonable rate of interest for a sufficient number of years,

and placing the management of the concern in a Directorate in whom the people had confidence and provided also the Government furnished half the capital. As regards water-supply there was scope for the construction of a large tank with an extensive catchment area to feed it close by the site selected for the location of the proposed mill. The Government should also investigate and tap all possible sources of electric power to be generated from natural and artificial waterfalls.

The Chief Engineer observed that he had sent a report to Government pointing out the difficulty of providing sufficient water for working the mill.

The President said that there was difficulty in getting the required machinery at present on account of the war. Pending the getting of machinery, plans and estimates might be prepared and sent up. The Davangere people did not seem to have made any further progress for the last six months beyond raising Rs. 5,000 upon which Government promised a grant of another Rs. 5,000. Not even a rough estimate of requirements was yet prepared. He hoped that the syndicate would be able to show more substantial progress during the coming year and be ready with all preliminary preparations including definite promises for subscribing the capital.

Ordinary Industries.

Mr. V. Rangaswami Iyengar moved the following Proposition :—

3. That in consideration of the fact that the prices of machinery imported are very high and large supplies are not available, the attention of the Industries and Commerce Department be concentrated on the development of art industries, such as sandal-wood carving, ivory work, silver and metal works, and that Government be requested to make a grant of Rs. 50,000, for the purpose.

A printed note containing details of the scheme had been circulated to the members.

The President enquired why steps should not

be taken to develop these industries by private enterprise instead of starting them as Government concerns.

Mr. Rangaswami Iyengar observed that such industries should not be treated entirely as commercial concerns. The object was to provide steady employment to the artisans and improve their handicrafts. Without some central agency the further development of the industries was greatly handicapped. It was not possible in every such case to show results but the individual benefits were large.

The President pointed out that Government could not be expected to give Rs. 50,000, without any information as to whether the scheme would be commercially successful or not. The Committee would however consider whether the scheme was necessary.

Mr. M. Chengiah Chetty moved the following Proposition :—

- 3a. That in the opinion of this Conference the time is now ripe for the development of the textile industry in the State by the extension of the scope of work of the Central Weaving Factory, by the opening of branches at suitable centres for demonstration work and by opening new Weavers' Co-operative Societies and sales depôts and museums for hand-made goods.

He also read a note explaining the present position of the industry and offering certain suggestions.

Mr. P. G. D'Souza then made a statement as to what action was now being taken in accordance with the suggestions made in Mr. Chengiah Chetty's speech.

Mr. M. Chengiah Chetty said that seven years had passed and nothing had yet been done. The Government had been spending money in many other directions. A separate administrative officer must be appointed to develop sericulture, cotton weaving and wool weaving, etc.

Mr. P. G. D'Souza said that proposals were under the consideration of Government in order to strengthen the staff and to give greater attention to more extensive development of the industry.

The President observed that Mr. Chengiah Chetty's paper read by him in support of the proposition would receive the attention of the Committee.

Mr. M. Chengiah Chetty said that the expenditure incurred was not commensurate with the requirements. Weavers were becoming poorer and the present was the time for ameliorating their condition. Four lakhs of people depended on weaving industry and those people had not been helped in any way.

The President said that the subject would be specially studied by the Committee which would then make recommendations.

Mr. Singri Nanjappa moved the following Proposition :—

- 3b. That an expert be engaged by Government to start cocoanut fibre industry on a large scale.

Mr. P. G. D'Souza explained that proposals had already been sent up by the Industries and Commerce Committee to Government and the result may be awaited to get the necessary machinery from Ceylon.

Mr. V. Rangaswami Iyengar also said that the Government might sanction the loan of necessary machinery for trial for six months on the hire purchase system.

Mineral and Chemical Industries.

Mr. V. S. Sambasiva Iyer moved the following Proposition :—

4. This Conference is of opinion that the following mineral and chemical industries for which raw materials are available should be started at an early date :—
- (a) Manufacture of soda bicarbonate from alkaline earth.
 - (b) Manufacture of bleaching powder and other commercial products from common salt.
 - (c) Manufacture of sulphuric acid.
 - (d) Manufacture of paints from ochres.
 - (e) Manufacture of powdered asbestos for lining boiler surfaces.
 - (f) Manufacture of emery paper from corundum.

He said that for the present he would recommend that investigation be taken up regarding the manufacture of sulphuric acid, soda bicarbonate, and bleaching powder. Sulphuric acid was the most important substance required for all industries. There were several factories in India which depended on imported stuffs. The Ranipet Factory had an output of seven hundred tons per annum. There was sale for at least five hundred tons per annum. It was easy to find use for five hundred tons because hundred and fifty tons, all imported, were utilised for the manufacture of aerated waters. They were importing over hundred tons of alum every year and the raw materials required to manufacture alum were white clay and sulphuric acid. They had any amount of white clay and therefore if they had enough of sulphuric acid they could stop the import of 100 tons of alum. A certain amount of money had been placed at his disposal and he would try and collect information and submit definite and workable schemes. Even if they manufactured 300 tons of alum per annum the concern would pay.

Mr. K. R. Srinivasa Iyengar observed that all information about the subject might be placed before the Industries and Commerce Committee and the subject need not come up before the Conference.

The President asked Mr. Sambasiva Iyer what practical steps he was going to suggest.

Mr. Sambasiva Iyer replied that the manufacture of bleaching powder depended on the manufacture of sulphuric acid and that the manufacture of soda bicarbonate was in charge of the Geological Department and the results obtained so far were very encouraging and satisfactory.

The President observed that the industries referred to by him may be further investigated.

Cottage and Rural Industries.

Mr. P. M. Basappa moved the following Proposition :—

5. (a) A survey be made of the most important existing rural industries in the State and the causes that tend

to retard the development of such industries.

- (b) Suitable facilities be provided for the persons engaged in such industries to increase their output, to give them proper facilities and training to improve the quality of the articles manufactured by them, to change design according to the requirements of the market and to organize the business side of the industries.

In doing so he said :—

The present state of commerce as is carried on and controlled by our people is verily in a deplorable condition and is going from bad to worse as the outsider takes full advantage of the absence of any strong organization in the State to control and retain its trade, in all possible lines and directions, for the benefit of our own people. The lack of spirit of enterprise and co-operation, no doubt, should be attributed to the people for this state of affairs. But how is this to disappear for a better state of things to suit modern conditions? It may be asserted that in countries where development in the field of commerce has reached marvellous progress, the people have passed the same stage in which we find ourselves at present. But then it is the State that has initiated with special privileges and protection every enterprise amongst unwilling and conservative people.

It is said in Japan, Government had to issue orders for the establishment of Joint-stock Companies when the people were not forthcoming of their own accord.

Every trade that is to be carried on, in any adequate scale consistent with full requirements of our own province at least, is not controlled by our own people, and still more discouraging is the fact that very few there are, who could go out of this State for commercial enterprises. Either there are men with large hoarded wealth who are accustomed to do the safest banking business and not meddling with any enterprise but let it alone for explorers, or there are men

with some initiative and enterprising skill but who can command neither capital nor public trust. Under such conservative conditions if any enterprises started without being backed up by necessary support should fail the discouraging effects on the investing public would be incalculable.

To stimulate private enterprise and to control commerce, the Deputy Director of Commerce, assisted by an advisory committee of the leading merchants of all lines of trade in the State, should organize schemes of enterprise and see that they are worked on sound and efficient lines with every facility that is necessary at the present state. To ensure the best results and to prevent mismanagement, such organizations must be so arranged as to suit our peculiar conditions. Unless such of those that are started in the initial stage, are worked out successfully, the development of commerce would be very slow.

Commercial managers of confidence and experience are necessary for such undertaking. Local men should be trained to manage such concerns, special training to merchants, as apprentices, should be arranged with well-known firms, both in India and in other countries. Preferential facilities in banking, freights, etc., should be shown to local men, until they take their due share in their own trade. Bank agencies should more freely be distributed in all parts of the State. The oppressing tendency of the foreign money-lenders should be discouraged by legislation.

The establishment of our Bank Agencies in Bombay and Madras with other necessary facilities to local merchants will greatly facilitate them to open their branches in those places and enable them to have a better controlling hand in the foreign trade of the State.

All such steps for the development of our commerce are in no way, novel in themselves, but such that have been successfully adapted and are still being adapted according to the changing conditions, with great benefits to the State and the people concerned.

In all progressive countries industrial expansion has always followed commercial prosperity. When once the people are trained in commercial enterprise, capital will be more largely and freely distributed and they will be better fitted to realise the advantages of industrial expansion and thus the work of the State in this direction will be more easy and will be met with better co-operation.

Some twenty years ago, about 80 per cent of the foreign trade of Japan was in the hands of the foreigners but it is now solely carried on by the Japanese themselves.

In conclusion, it may be said that the existing defects that are obstacles to progress might be set aright under strong semi-official initiative for the rapid progress and control of our commerce in the State.

The President said that Mr. Basappa might name the industries in which there was money and place any practical suggestions that he may have to make before the Committee.

Investigation of New Industries.

Rao Saheb M. Rama Rao moved the following Proposition :—

6. This Conference is of opinion that special arrangements should be made to conduct investigations in regard to the following :—

- (a) Investigation of all vegetable tanning resources of the State with special reference to the more economical methods of utilising them in the shape of extracts.
- (b) Investigation of the subject of utilising the elephant grass available in large quantities below the Vani Vilas Sagara for the manufacture of straw-boards and formulating a complete scheme for establishing the industry on a commercial scale.

The mover had prepared a note on the subject. He said that at present *tangadi* was the only tanning material utilized in the State. There were several others. The matter required

careful investigation. He would have necessary tests conducted and report the result.

Mr. M. G. Rama Rao moved the following Proposition :—

6. (c) This Conference is of opinion that special arrangements could be made to conduct investigation of the following industries :—

- (1) Agave fibre.
- (2) Cinnamon oil extraction.
- (3) Roshagrass oil extraction.
- (4) Manufacture of potash from wood-ash, etc.

Mr. Rama Rao said that plans and estimates were being prepared. He would submit proposals to Government for the sanction of money required to carry out the work.

Industrial and Forest Research.

Mr. G. Girimaji Rao moved the following Proposition :—

7. This Conference is of opinion that with a view to investigate into the forest and industrial resources of the State and provide facilities for such research work it is necessary to form a separate section in the Forest Department to deal with the economics of, and research work in forestry and arrangements made to separate and develop the commercial side of the work of the Forest Department.

He said that the proceedings of the first Mysore Forest Conference held in October, 1917, would convince any one of the necessity of having a separate section of the Forest Department for the purpose stated in the proposition. It was not meant that the head of the Forest Department should have nothing to do with the commercial side of the work of the Forest Department. In that case there might be the greatest objection. One would be concerned with conservancy protection and reproduction and the other with exploitation and the two sections if worked under separate and independent heads, might clash with each other. What

was wanted was a technical branch and a commercial branch working independently under one head. The Government have been pleased to sanction the temporary creation of a separate section in the Forest Department to deal with forest industries. Sanction had been given for starting the nucleus of a research laboratory. The great world war had opened a wide field for forest products. It was understood that a scheme for the purpose mentioned in the proposition was under the consideration of the Conservator of Forests. The proposition was only meant to show that the Conference also was of opinion that the formation of a separate section was necessary and advantageous.

Mr. M. G. Rama Rao said that proposals had already been submitted to Government on the matter.

The President observed that the matter would be considered and the order communicated to the member.

Banking and Trade Facilities.

Mr. K. P. Puttanna Chetty moved the following Proposition :—

8. This Conference recommends to the Government the urgent necessity for the formation of a Land Mortgage Bank.

He said that the question of starting a Land Mortgage Bank was under the consideration of the Agricultural Committee and that a week ago at a meeting held in Bangalore of the Sub-Committee for Agricultural Finance certain resolutions were arrived at which he would place before the Conference. The Sub-Committee's recommendations were the following :—

(1) That in the opinion of this Committee it is necessary to have an organization for providing long term credit on the security of land.

(2) That this organization should exist side by side with co-operative societies and that to avoid competing with such societies it should not grant loans of less than Rs. 2,000 or for periods of less than five years.

(3) That this organization should consist of a central institution and of local agencies wherever necessary.

(4) That the working capital of the institution should consist of an initial share capital of about rupees ten lakhs and of money raised by floating debentures on the security of Government in the principal money markets in India.

(5) That this organization should be a joint-stock concern with limited liability and that the amount of the debentures should be regulated by Government from time to time according to actual requirements. The bonds should be issued only to the extent of the loans sanctioned on the mortgage of real property.

(6) The instalments for repayment should be fixed so as to include the interest on the loan, cost of management, and a sinking fund for payment of the loan.

The Sub-Committee considered that if Government agreed to secure the debentures as proposed in the proposition the other details might be worked out after taking expert opinion. Co-operative Societies already lent money on mortgage of land and it was thought that loans for sums exceeding Rs. 2,000 and for periods longer than five years should be lent by the Land Mortgage Bank. Opinion was divided on the question whether the concern should be on a co-operative basis or a joint-stock concern. Messrs. Balasundaram Iyer and Ranga Rao considered that a co-operative basis might be given to the organization but the majority of the members of the Sub-Committees were of opinion that the organization should be a joint-stock concern.

The President enquired why Government should stand security for raising debentures.

Mr. K. P. Puttanna Chetty said that though the share capital would be raised locally it was necessary to attract money from outside and that could be efficiently done only by the State lending its credit to the movement.

Mr. M. Shama Rao opposed the proposition and observed that in European countries Land

Mortgage Banks had not succeeded to the extent that the organizers wished. In Germany and France poorer land-owners had not been benefitted by Land Mortgage Banks. Two thousand rupees was the amount fixed for loans. The average holding in Mysore was five or six acres. The price of an acre came to about Rs. 100 to Rs. 135. It was Rs. 50 according to the figures given by the President. If loans were to be restricted to a minimum of rupees two thousand, the estate must be worth something more. The majority of the people would not be benefitted by a Land Mortgage Bank. He did not see why Government should put itself to expenditure for the benefit of a small number of people.

Mr. K. P. Puttanna Chetty observed that it was not intended to supersede co-operative societies so far as small loans were concerned. Small land-owners would not seek loans from Land Mortgage Banks. There would be no clashing of interest between the two institutions.

Mr. K. R. Srinivasa Iyengar observed that if the object of the proposition was to relieve indebtedness the attention of the Conference should be directed to the question of relieving the indebtedness of small land-owners. The Land Mortgage Bank was probably intended to help only those whom co-operative societies did not help. He did not know whether it was advisable for Government to help to relieve the indebtedness of a few large land-owners. He doubted whether Government could take the responsibility of standing security for all debentures raised by the Land Mortgage Bank. The question as to what kind of control Government could exercise over the transactions of the proposed Bank and a number of other important questions required to be considered very carefully. The subject might in his opinion be referred to the Committee.

Mr. C. Ranganatha Rao Saheb explained the scheme of Land Mortgage Banks in Japan. The scheme was intended to meet the capital requirement of people who could spend money

on lands which were capable of being improved and it did not matter whether the area of the land was small or large, so long as it was capable of improvement. The Land Bank would fill the same part for land that Industrial Banks did for industries.

The President enquired how a loan of rupees two thousand and over could be granted on the security of small holdings worth considerably less than the amount of the loan.

Mr. C. Ranganatha Rao Saheb replied that the minimum amount of the loan might be reduced to rupees one thousand and that money would not be lent except on good security.

Mr. M. Shama Rao observed that in this connection there was a Royal Commission Report of the British Government with reference to the relief of Irish peasants. The Committee might consider that report in deciding this question.

Mr. C. Ranganatha Rao Saheb pointed out that the Government was required only to lend its name because the working capital would have to be raised in the principal money markets of India which were outside the State and nobody in Bombay or Calcutta knew the value of lands in Mysore.

Mr. K. Chandy observed that poor land-owners if they wanted money to improve their lands might join together and obtain loans from the Land Mortgage Banks on the total security of their lands. Government security was necessary, as otherwise it would not be possible to raise money from money markets outside the State.

Mr. C. S. Balasundaram Iyer observed that at present, Co-operative Societies were lending money for periods up to ten years. If a Land Mortgage Bank was started immediately and lent money for such periods, Co-operative Societies would fall into disfavour. In order that the proposed Land Mortgage Bank might not prejudicially affect the existing Co-operative Societies, a different period was suggested, and a period of five years and less would prejudice neither the interests of the societies nor those of the poor land-owners.

Mr. M. Subbiah observed that raiyats did not go in for loans unless they wanted money for marriages, etc. For improvement of lands very few raiyats borrowed money. If it was the object of a Land Mortgage Bank to lend money for the improvement of agricultural lands he was afraid the object of the Bank would not be fulfilled.

Mr. H. Krishna Sastri speaking in support of the proposition observed that Co-operative Societies could not accommodate large land-owners. Unless and until Land Banks came into existence, no raiyat could be relieved of his prior indebtedness nor could he improve his economic condition. As it was at present thought the raiyat earned a good lot from his lands he could not make both ends meet and get out of the clutches of the sowcar.

Mr. K. Krishnamurthi Rao also supported the proposition and added that adequate relief would be given to large land-owners by a Land Mortgage Bank. The Secretary, Agricultural Committee, pointed out that the special Committee had gone into Mr. Narayana Iyengar's suggestions carefully and come to a conclusion that a Land Bank was necessary.

Mr. M. A. Narayana Iyengar observed that a Hypothec Bank did not lend money to relieve borrowers from prior debts but only to enable them to improve their lands. He had gone into the matter fully as Registrar of Co-operative Societies and was of opinion that the Co-operative Societies with a central organization to finance them could undertake all the functions assigned to the Land Bank and a State-aided Land Bank would be fatal to the co-operative movement. He invited attention to his note on the subject, a printed copy of which had been placed before the meeting.

The proposition was put to vote and carried by a majority.

The President observed that the Agricultural Committee may now work out all the details and submit their recommendations to Government who would consult experts and the

subject, may, if necessary, be again discussed at the Conference.

Mr. B. K. Garudachar moved the following Proposition :—

9. This Conference recommends that the following facilities and concessions be given to trade and industries in the cities of Bangalore and Mysore :—

- (a) Reducing the charge for electric power utilised for industrial concerns from one anna to nine pies per unit.
- (b) Arranging for telephone connection being granted to private houses and firms as recommended by the Chamber of Commerce for Rs. 75 a year for each house connection for a period of two years, any loss to the Department being made good from the funds of the Economic Conference.

Mr. S. G. Forbes pointed out that the rates prevailing in Mysore were much below the rates charged in Bombay where five annas per unit was charged and that the rates in England and United States were also much higher.

Mr. B. K. Garudachar observed that the State was spending lakhs of rupees on industrial concerns and that the concession asked for in the proposition might be easily granted.

The President observed that the Electrical Department was a commercial department and that no concessions could be got from that Department.

Mr. B. K. Garudachar observed that the establishment charges were too large so that the rate of power had to be high.

The President observed that if more figures could be given to show that the establishment charges were too much, the Committee would consider the matter.

Mr. K. Krishnamurthi Rao moved the following Proposition :—

- 9. (c) Making electrical power available for industrial purposes wherever required within a radius of 50 miles from the main line.

The President observed that the subject would be noted by the Committee.

Mr. M. L. Vardhamaniah moved the following Proposition :—

- 10. That with a view to give an impetus to the formation of Joint-stock Companies the table of Registration fees now forming part of the first schedule to the Mysore Company's Regulation of 1917 be revised in such a manner as to help the promotion of such companies without undue delay and hardship on the part of promoters.

The President observed that the subject would receive the attention of the Registrar of Joint-stock Companies.

The following proposition of the Kolar District Committee was then placed before the Conference by Mr. G. Girimaji Rao.

- 12. That an enquiry be instituted into the various causes that have prevented the successful introduction of weights and measures and immediate steps be taken to establish a uniform system of weights and measures all over the State with a view to prevent fraudulent practices.

Mr. Grimaji Rao said :—The Mysore Weights and Measures Regulation, III of 1902, was passed so far back as July, 1902. It enables Government to fix standards of weights and measures and to frame rules. The Regulation also enforces the keeping by Government in certain offices of copies of standards and declares what are false weights and measures. More than this, the Regulation does not provide.

It was not till after ten years of the passing of the Regulation that rules were framed and brought into force. (*Vide* Notifications No. J. 864—Legis. 16-09-37, dated 11th September, 1911, and No. J. 3591—Legis. 16-09, dated 5th June, 1912.) The use of the British or the metric system of weights and measures or any other recognised system not based on a weight or measure called the "Seer" or any sub-division

or multiple thereof, as a unit, is exempted from the operations of the aforesaid rules.

The subject was again referred to the Industries and Commerce Committee "for the preparation of a list of points on which remedial action was required and the submission of definite proposals with a view to secure to the people all the advantages of a standardised system". The note on weights and measures drawn by Mr. C. Ranganatha Rao Saheb, the then Secretary to the Industries and Commerce Committee and the present Deputy Director of Industries and Commerce, was circulated among the Deputy Commissioners and other Heads of Departments and their opinions were invited. After duly considering the recommendations of the Committee and the opinions of other officers, Government have passed orders in G. O. No. 5082-131—A. & I. 215-14, dated 5th January, 1917. This is the latest order on the subject. The Industries and Commerce Committee pointed out that very little progress was made in the adoption of the standard system. The unsatisfactory results were attributed mainly to the absence of a definite agency to see that the use of the recognised measures is encouraged by the provision of adequate facilities to obtain them and that of false measures discouraged by frequent inspections and tests. The remedial measures suggested by the Committee with some modifications have been approved by Government. Stamping parties are provided for testing and stamping measures and weights already in use, and to sell at a cheap rate approved weights and measures to all who require them. Provision is also made for a sufficient supply. Existing defects in the present measuring *seer* are removed and the use of bamboo measures is prohibited. Multiples and sub-multiples of the *seer* by measures and weights would be made available easily. Frequent inspections and tests are also arranged for.

The aforesaid innovations are very good so far as they go. There might be perceptible increase in the number in use of measures and

weights of approved patterns. But still there are other causes that have prevented the successful introduction of weights and measures. There is no uniform system of weights and measures all over the State. Different values are ascribed to standards of the same name even within limited areas. Different articles have different standards of the same name. Unless uniformity is secured, fraudulent practices will not cease. To secure this uniformity the interests of the mercantile community and the raiyats have to be consulted. As things stand at present, the maund is 40 seers in one place, 42 or 42½ seers in another place and 46 seers in a third place, and so on. The standard of a maund is one thing for the wholesale seller and another for the retail purchaser. Coffee and cardamoms have standards of their own. The *khandi* is 180 seers in one place, 185 seers in another and 200 seers in a third place and so on. Pound weights are freely used in retail sale in seers and *pancheru*. The buyers do get less weight than they would have got if seer weights had been used. The existing rules and the proposed modifications, it is feared, would not be able to effectually remove these variations. Nor could these cases be easily brought under the penal provisions of the Regulation.

The Imperial Weights and Measures Committee of 1913-14 consisted of three members. They agreed that a uniform system of weights and measures was desirable. But they were unable to agree as to which system of weights and measures should be made compulsory. Two of the members favoured the Railway system based on the seers of 80 tolas of 180 grains, while the dissentient members advocated the Metric system. Mr. Alfred Chatterton in his paper read at the eleventh Indian Industrial Conference urges the use of British weights and measures for India and lessening the weight of the rupee from 180 grains to 175 grains, so that it might become exactly one-fortieth of a pound. Mr. Ranganatha Rao Saheb in his paper read at the same Conference pleads for a system

of weights based on the reduction of the weight of the rupee by five grains.

The present rules in Mysore recognise more than one standard of weights and measures. The variations now existing might be due to this circumstance or might be due to some other causes. The merchants and raiyats in various important trade centres will have to be examined regarding the existing practice and the measures they would suggest to secure uniformity in the standards of weights and measures throughout the State. When such an enquiry is completed we will have enough of materials for taking some definite action to establish a uniform system of standard weights and measures. As uniformity is urgently necessary, the enquiry also has to be taken up immediately. Of course, there will be some difficulty in taking definite action until a uniform system of weights and measures is introduced in British India. But this need not deter us from proceeding with the enquiry. The Deputy Director of Industries and Commerce might be entrusted with this work. In the places of enquiry, he will take the help of one or two prominent merchants and conduct the investigation. The local Government officers will, of course, render all the necessary help. Opinions might be invited on the proposals to be submitted by the Deputy Director and the subject might also be discussed in the Industries and Commerce Committee. Final recommendations might then be made to Government for consideration and orders.

In reply to the President's question as to what steps were being taken to manufacture standard measures Mr. V. Rangaswami Iyengar said that the matter was pending report to Government.

Mr. C. Ranganatha Rao Saheb said that it was impossible now to manufacture measures which formerly cost five annas even at a cost of five rupees. He was engaged in making some enquiries into the matter and he would submit a report to Government in about a week.

Mr. K. Krishnamurthi Rao observed that

sheet metal was not necessary to manufacture measures. If private parties produced measures manufactured by themselves they could be stamped by Government.

The President observed that the subject would receive special and early attention.

Rao Saheb M. Rama Rao moved the following Proposition :—

14. (a) That Government be requested to order investigations to be made regarding the feasibility of improving the waterways of the Bhadra, the Tunga, and the Kapini rivers for using them for transporting wood and bamboos.

The President observed that the subject and the note prepared by the mover would be considered by the Committee.

Mr. K. Krishnamurthi Rao moved the following Proposition :—

14. (b) That the Industries Department be directed to maintain a stock of all the machinery and the implements required for industries likely to be started in the State and that whenever there is no such stock the estimated cost of the required machinery be paid over to the applicant to purchase the necessary machinery in the most convenient market provided he satisfies the department or the local officers concerned that the loan will not be utilised for other purposes.

The President said that action would be taken in the matter after the war.

Mr. M. Venkatakrishnayya moved the following Proposition :—

14. (c) That periodical information be published by Government for the information of the public showing the financial condition of all industrial concerns either owned or aided by Government.

Mr. J. S. Chakravarti stated that steps had already been taken in the matter.

Mr. H. Rangaswami Iyengar moved the following Proposition :—

14. (b) That it is necessary in the interests of the Economic development of the State that facilities should be given to promoters of industrial concerns for the prompt (a) location of their works, (b) laying in of water, (c) erection of machinery, and (d) supply of electric power, wherever available at rates that might not handicap the ventures concerned.

Mr. P. G. D'Souza made a statement as to what steps had been taken in regard to the formation of industrial suburbs in the cities of Bangalore and Mysore.

The President observed that the creation of facilities for the location of industrial concerns in all cities and towns should be a most important subject for consideration in the coming year and receive continuous attention.

At this stage the Conference adjourned for lunch.

After Lunch.

The Conference resumed its sitting after lunch at 3-30 P.M.

Mr. M. A. Narayana Iyengar moved the following Proposition :—

8. (d) This Conference recommends to Government the starting of a Provincial Co-operative Society of a purely federal type with concessions from Government in its infancy similar to those granted to the Mysore Bank.

He said that the Co-operative system had proved its utility for some time now having reached a membership of 75,000, with a capital of 75 lakhs. The co-operative organization has now been placed on a solid basis. There was, however, one fundamental defect as they had no institution at the top that would finance all the Co-operative Societies. The higher banks had not risen to the occasion. The Mysore Bank got certain aid from Government and its re-

serve fund amounted to three lakhs. It had a large working capital chiefly due to the support it had received from Government. If only a proper apex bank could be organized with a share capital of ten lakhs of rupees and sufficient backing from the State, the central apex bank would also draw from outside whatever capital was required by means of long term debentures and the movement would have at its head a bank whose revenue would exceed a crore of rupees. Every Co-operative Society in the State had at least a reserve fund of Rs. 1,000. Each society would take shares in the Central Bank. The Bank would only require a certain amount of aid from Government as they had not come to the stage when such institutions would come into existence without Government aid. A special officer would be put in charge of the Bank for the first six months. Half the initial expenses for the first five years should be contributed by Government with a grant of five lakhs of rupees on easy rates of interest and a Bank started on those terms would be able to build up a reserve fund. He did not want Government guarantees but sufficient support in the beginning.

Mr. N. Rama Rao explained that the proposal for a Land Bank was intended to meet the demand for long term credit on the security of land, both for permanent improvements, and for paying off old mortgage debts, where such repayment tended to greater efficiency of agriculture. Co-operative Societies which raised working capital on short term deposits could not well lend for very long terms. The money for long term real credit should come from long term debentures. Perhaps, the real role of Co-operative Associations was to lend for current expenses on personal security, and not for permanent improvements on real security; but co-operative societies had as a matter of fact lent fairly large sums for fairly long periods, and it would probably affect their popularity to prevent them from continuing this practice. It was, however, necessary to draw a clear line of demarcation between the functions of a

Land Bank and those of Co-operative Societies. The line should be drawn with regard to two points—the amount, and the term. The Sub-Committee had proposed Rs. 2,000 and five years as the limit for Co-operative Societies. This was purely arbitrary; the limit might be lowered to Rs. 1,000 and three years if circumstances demanded it, all other loans on the security of land being given by Land Mortgage Banks. Co-operative Associations would still have an unlimited scope of usefulness and would thrive all the better for being relieved of uncongenial work. The establishment of an apex co-operative bank was not touched by the proposal to establish a Land Bank.

The President observed that Mr. Narayana Iyengar might again bring the subject before the Committee.

Agriculture.

Dr. L. C. Coleman moved the following Proposition :—

1. That with a view to improving the existing Agricultural Organization and introducing agricultural improvements more rapidly, this Conference considers the following measures necessary :—

- (a) Experiments may be started in the consolidation of agricultural holdings in one village of each model taluk with the object of ascertaining how best it can be accomplished.

In moving the above proposition Dr. Coleman said :—Two obstacles stand in the way of the introduction of agricultural improvements into India which have not received that amount of attention which they deserve. These are (a) the small average size of the holdings, and (b) their scattered nature, holdings often consisting of many parts situated at considerable distance from each other.

The Mysore Season and Crop Report for 1916-17, gives us for the first time information as to the size of the holdings in the State. We

find from an examination of the report that over 60 per cent of our agricultural holdings are 5 acres or less in extent while over 85 per cent of them are 10 acres and under. Some Districts show what appears to be much more unfavourable in this regard than others. Thus, for example, in Hassan District holdings 5 acres and under comprise 82 per cent and holdings 10 acres and under, 93 per cent of the total.

An economic holding may be defined as one which is capable of supporting an average agriculturist's family without forcing its owner to subsidiary occupations to eke out his livelihood. Whether a holding is economic or not depends upon many factors of which size is only one. The quantity of the land and the climatic conditions and the presence or absence of irrigation are other factors of the greatest importance. There is, however, undoubtedly a minimum area beneath which it would be impossible for the average raiyat to support himself and his family from the produce of his holding alone. Just what that minimum is, in any particular district in this State, we are, I think, not in a position to say, but I believe we shall be safe in saying that a holding of 5 acres or less is, under our conditions, very rarely an economic one. If this supposition is correct we are faced with the serious fact that about half our agriculturists are attempting the impossible task of making a living on areas which are too small to support them and their families.

But the difficulties which face our agriculturists in connection with the question of land do not end here. Many if not most of the agricultural holdings in India do not consist of a single block of land but are, on the contrary, made up of small pieces scattered here and there throughout a village or throughout a number of neighbouring villages. As far as I am aware, no serious investigation of the extent to which holdings are scattered has yet been made in this State. I had planned an investigation in one or two villages near Bangalore

but unfortunately circumstances have not allowed us to carry it out. To show to what extent sub-division takes place in India some cases investigated by the Hon. Mr. Keatinge, Director of Agriculture, Bombay, may be cited. In a village in North Canara he found that a compact block of 50 acres was divided up into paddy sugar-cane plots, and cocoanut cultivation. One of the more substantial cultivators in this village cultivated in all 18 acres of paddy land. Of this he owned 3 acres and leased 9 acres. The 12 acres were divided into 21 different plots. Mr. Keatinge points out in his note the hopelessness of contemplating improvements in irrigation and cultivation under such conditions. I feel sure that we could find conditions very similar to this in the arecanut and paddy tracts of our *malnad* and in the paddy areas under many of our tanks and channels. In another village in the Ratnagiri District, Mr. Keatinge found an area of $30\frac{1}{2}$ acres of paddy land divided up into 49 separate plots which were owned by 17 different cultivators. Of these 17 men, 7 held their land in one block while the others had their holdings in from 8 to 9 separate plots very irregular in shape and scattered all over the area. These are by no means the worst cases found by this investigator. In fact, in one case a landlord owning 48 acres of paddy land had it divided up into 53 separate plots. It seems highly probable that conditions in Mysore are little, if any, better than those found by Mr. Keatinge in Bombay.

The difficulties arising from the small size of our agricultural holdings are such as cannot be easily removed, but we must force the fact that they are now and will remain a serious hindrance to agricultural progress. Undoubtedly these difficulties can, to a considerable extent, be overcome, through the spread of agricultural co-operation in the State. Improvements in the cultivation of his land which the small cultivator cannot introduce while working independently he may be able to intro-

duce if he works in co-operation with his neighbours. I shall not dilate upon this matter here as it will come up in another connection.

If we turn to the scattered nature of holdings there seems to me little doubt that very great improvement is possible. This question has recently formed the subject of considerable discussion on the part of economists and agricultural workers in India while it also occupied a prominent position on the agenda paper of the Board of Agriculture at its recent meeting at Poona. Tentative schemes have been advanced by Professor Stanley Jevons of the Allahabad University and Mr. Keatinge, Director of Agriculture in Bombay. Before turning to a consideration of these schemes, however, I think it would be advisable to consider what is being done in this connection in other parts of the world, for India is not the only country which is suffering from the evil effects of scattered holdings.

Let us first of all look at conditions in Japan. Japan is pre-eminently the country of small holdings. Seventy per cent of the Japanese farmers possess holdings of an area less than $2\frac{1}{2}$ acres while only 3 per cent possess lands more than $7\frac{1}{2}$ acres extent. Moreover, almost $70\frac{1}{2}$ of the cultivated area in Japan is in holdings of less than $2\frac{1}{2}$ acres, conditions which are, apparently very much worse than those prevailing in Mysore. The agricultural holdings in Japan are also for the most part subdivided into small and irregular plots with an insufficient and sometimes irrational system of roads and often imperfectly and unsuitably irrigated and drained.

The seriousness of this state of affairs from the standpoint of agricultural production has not escaped the attention of the Japanese and so long ago as 1899 steps were set on foot to remedy the evils attending sub-division. The first Law for the re-adjustment of land was passed in 1899 and came into operation on the 1st of January, 1900. The Japanese

Government estimated that through the consolidation of holdings an increase of 3 per cent in the productive area could be brought about by the utilisation of boundary areas between adjacent plots while by their reclamation of land which also formed a part of the scheme a further considerable increase would be obtained. They estimated that the re-adjustment would lead to a total increase in the yield of the land of at least 15 per cent. As a matter of fact in the first 50 farms which came under the operation of this act actual increase in production of 38 per cent was obtained.

The operations connected with this work were not confined to consolidation and re-stripping of the land. Thus to the cost of surveying which is itself considerable where plots are small and numerous, had to be added the large sums spent on canalization, irrigation and drainage.

Under this law, the work of re-adjustment, restripping and the making of dikes, roads, etc., was entrusted to associations of landlords formed for the purpose. It also gave the right to carry out this work to individual landlords who furnished sufficient guarantees of ability to meet their engagements. With the object of facilitating such undertakings, the law exempted contracts from registration fees, made free grants out of crown lands so as to facilitate the restripping and gave to competent authorities the right to fix, in each individual case, the indemnities compensating proprietors for losses suffered through the application of the law. Dikes, roads and embankments belonging to the State which became useless were handed over free of cost but no compensation was paid for lands utilised for new ones.

Between 1900 and 1902 applications had been received under the law for the re-adjustment of over 8,000 farms with a total area of 3,50,000 acres.

Certain technical and administrative defects in this law came to light during its working with the result that in 1909 it was replaced by

a new one. While the earlier law concerned itself principally with the utilization of boundary lands and the improvement of irrigation, drainage, dyke and roads, the new law, while making provision for these, contemplated the reclamation of uncultivated land and the adoption of that kind of farming most suited to increase the yield and best adapted to the character of the soil.

The new law assigned the task of carrying out the work, chiefly to syndicates formed among the land-holders concerned and recognised as incorporated bodies. In order to obtain authorization to form such a syndicate, it is necessary to obtain the consent of at least half the land-owners within the area in which the syndicate intends to work on the further condition that such land-owners represent at least two-thirds of the area of value or the land to be readjusted. Special reductions are also allowed as a further inducement while money is supplied to Syndicates at low rates of interest by the Japanese Mortgage Bank and certain other Banking institutions.

Under this new law, within less than two years, applications had been received for the re-adjustment of 2,614 farms with an area of 3,90,000 acres against 2,129 farms with an area of 3,50,000 for the eight odd years during which the previous law was operative. This indicates pretty clearly that the new law is meeting the needs of the Japanese agriculturists to a very remarkable extent.

As a result of the operation of these two laws, the cultivated area in villages where they have been in operation has increased by 10 per cent while the rice area has increased by 40 per cent.

With regard to the expenses involved in the work of readjustment they have been, as already indicated, pretty high. For the first 490 estates under the first Act the cost worked out at about Rs. 80 per acre. Estimates for the readjustment of 1,532 estates for which schemes were approved between the 30th June, 1910, and the 31st August, 1911, worked out

at the rate of Rs. 110 per acre. The Japanese Government foreseeing the difficulties arising from this large outlay have granted special facilities in arranging loans, remitting taxes and granting large subventions which are administered by the Department of Agriculture and Commerce. From this it is clear that while the expenses are high, the benefits to be derived are such as to warrant them; otherwise it is clear that the Japanese Government would not show such marked interest in the furtherance of the scheme.

The question of the readjustment of the holdings has received much attention in many countries of Europe, also notably in Russia, Austria and Switzerland. The procedure in each country has been very similar to that described for Japan. In Austria, the Government has been particularly generous, bearing in most cases about three-fourths of the expenses involved and the results in this country have been even more striking than in Japan. It is stated that in Austria the expenditure incurred has been entirely recovered in two years' time by the increased annual yield. The expenses per acre in that country have been very much less than those given for Japan, varying from Rs. 3 to Rs. 7-8-0 per acre, while the increase in value of the land averaged over Rs. 100 per acre.

In Austria, readjustment takes place on the decision of half the landholders of a commune who must, however, own two-thirds of the land to be readjusted. For the initiation of the work involved in preparing estimates, etc., it is enough if the application is made by one-third of those concerned provided they enjoy one-third of the net revenue.

Enough has been said to indicate the general lines upon which legislation with regard to the consolidation of holdings has been framed and the results which have been achieved. It remains to consider whether the conditions prevailing here warrant us in expecting similar results in Mysore.

In the first place while we have very little

accurate information on the subject, I think there can be little doubt that our conditions with regard to the scatterings of holdings are quite as bad as they are for instance in Austria, although possibly not as bad as conditions prevailing in Japan. The same difficulties confront us here in the way of dividing up land among heirs as have prevailed in Japan and certain countries of Europe and it is of course this which has largely brought about our conditions.

It seems to me that a consolidation of holdings will lead certainly to just as big an increase of productive area and possibly to just as large an increase in production as it has in Japan and it therefore seems highly probable that it would be financially very profitable. However, we do not know what the expenses connected with such a consolidation would be and before we have an approximate estimate of this it will be difficult to draw up any definite plans.

With regard to the difficulties which will result from the working of the Hindu Law of inheritance I do not feel competent to speak. I leave that to other members of the Conference. I wish only to point out that our conditions are not unique in this regard. Both Japan and Austria had to face much the same difficulties. Mr. Keatinge has suggested as a way out of this difficulty that a law should be passed enabling owners to register their holdings as economic ones, such holdings thereafter to be impartible. The Mysore Government have also seen fit in connection with the large landed estates scheme to ensure the impartibility of such estates. It is quite clear that unless some regulation is passed which ensures the impartibility of a holding which has once been consolidated, very little permanent benefit is likely to result. I personally feel that impartibility should be one of the essential conditions to be laid down before a scheme of consolidation and restripping is undertaken or at least that a minimum area

should be fixed below which no further sub-division should take place. Where a division of property among heirs does take place regulations should be framed to ensure that the resulting sub-divisions are in compact blocks.

Prof. Stanley Jevons in a very able paper on this subject has suggested the advisability, as an experimental measure, of a whole village being acquired, the holdings restripped and redistributed. His scheme, in addition to providing for compact economic holdings, contemplates the formation of others too small to be economic which would become the property of those who supplement their agricultural income by that received from some other occupation. What the resolution before you contemplates is nothing so drastic as this. It simply contemplates that the holdings as at present existing should be redistributed so as to allow for more economic cultivation. Before any action can be taken a very careful enquiry is necessary.

It has been proposed to have in each District a model taluk. In each model taluk I would pick out a fairly prosperous and typical village for enquiry. I would then have a survey of the village made showing the holdings, types of soil, irrigation facilities and any other factors likely to influence the consolidation. From the data thus collected it should be possible to draw up an estimate of the cost of restripping and consolidation. Should the restripping prove feasible from a financial standpoint and should 50 per cent of the land-owners owning two-thirds of the land be agreeable, it might then be undertaken. I believe that in such experimental villages all the expenses connected with the work of surveying and consolidation should be borne by Government and I feel certain that it would be money well invested.

I can hear some of the members of this Conference saying:—"A very laudable resolution no doubt but quite impracticable". Possibly some of those critics are among those

who talk glibly of the economic struggle which is upon us. I would ask such critics how we can possibly prevent our being crowded to the wall in this struggle if we do not arm ourselves. How much consolation shall we be able to draw from the thought that we have preserved our ancient customs and laws inviolate when we find ourselves definitely and finally consigned to the scrap heap of inefficiency. Just a year ago in this hall I stated in speaking upon another subject that if certain agriculturists were not in a position to meet the competition which was upon them they would have to go to the wall and some members took exception to the remark. Well, gentlemen, during the past year we have had some striking examples of the fate of the inefficient. Surely in the light of what we have seen we are not going to remain blind to the urgent necessity of doing everything in our power to fit our agricultural population for the coming struggle.

Mr. T. Narasinga Rao seconded the proposition and observed that in regard to the sub-division of holdings it was the business of Government to check the excessive sub-division of holdings and their undue diminution. The Agricultural Committee should carry out certain experiments to show what improvements could be effected by consolidating lands. Such a consolidation had been effected in the Punjab Canal area and also in Poona.

Mr. K. P. Puttanna Chetty suggested that the subject might be placed before the next session of the Representative Assembly in order that the large number of agriculturists sitting in that Assembly might take part in the discussion of the subject.

Mr. C. S. Balasundaram Iyer suggested that the Agricultural Committee might carry out investigations in a few select villages and then submit proposals to the Conference.

Mr. K. Matthan observed that a good beginning may be made in the new areas to be brought under cultivation under the Kannam-

badi where arrangements are made for starting a sugar manufactory. A large area of lands extending to 20,000 or 25,000 acres would be required. The existing arrangements with regard to holdings would have to undergo extensive alterations in order to bring about a consolidation of holdings. The Conference might appoint a Committee to consider the question in all its details.

Mr. Mir Humza Hussain observed that provision might be made in the Code prohibiting the partition of small holdings.

The proposal to appoint a Committee to consider Dr. Coleman's proposition was put to vote and carried by the Conference, only one member voting against it.

Mr. R. Ranga Rao opened the discussion on the following subject :—

1. (b) Developing agricultural co-operation by the appointment of a special staff and by arranging for a more extensive survey of agricultural indebtedness especially in the malnad.

Mr. N. Rama Rao said that Government had been requested to appoint a committee to consider the question.

Mr. R. Gopalswami Iyer moved the following Proposition :—

1. (c) Expanding the Agricultural Department so as to enable it to take up the taluk as its unit for development work.

He said that either the man who owned lands must have knowledge of his business or the Government must have a trained agency to advise raiyats. The raiyats must be induced to go to foreign countries and obtain experience. He also suggested that the agricultural staff and the staff of the Agricultural College must be kept distinct. He, therefore, strongly urged the appointment of an Agricultural Inspector for each taluk with fieldmen under him to carry demonstration to the very doors of the raiyat.

Dr. Coleman moved the following Proposition :—

2. That in order to facilitate the introduction of improved Agricultural implements, this Conference recommends that—

- (a) as over 50 per cent of the Agricultural holdings in Mysore do not exceed five acres in extent, special attention be paid to organizing co-operative use of improved implements which are beyond the means of such small holders.

The President enquired whether the Registrar of Co-operative Societies could not arrange for the starting of more non-credit Societies.

Mr. R. Ranga Rao said that the Agricultural Department was a more suitable agency for the purpose.

The President said that when a complete scheme came up before Government it would receive attention.

Mr. T. Narasinga Rao moved the following Proposition :—

2. (b) A separate factory for manufacturing improved implements adapted to local requirements on a large scale be established.

He said that the implements now manufactured by the factory were not satisfactory. What was wanted was a factory with a real expert trained in the manufacture of ploughs who would be able not only to improve local implements but introduce and adapt to local requirements improved implements.

Dr. L. C. Coleman said that raiyats got ploughs at a greater cost now than before. He looked forward to a time when the Agricultural Department could sell even 20,000 ploughs a year.

The President said that the subject might be considered by the Committee and that the Committee might work up and submit a scheme for a large factory to manufacture ploughs making arrangements if necessary to appoint a suitable expert.

The proposition was put to vote and carried.
Mr. A. Ramanna moved the following Proposition:—

Organization of Manurial Resources.

3. That as the Agricultural prosperity of the State depends on the organization of its manurial resources, this Conference considers it absolutely necessary that the following measures should be adopted:—

- (a) Encouraging growth of oil seeds by establishing oil mills in central localities so as to create a local and ready market for the produce.
- (b) Preventing export of materials of manurial value and utilising them locally.
- (c) Remission of water rate, not exceeding half the assessment under the tank, if an extent of not less than half the *atchkat* under any tank is planted with green manure crops.
- (d) Local manufacture of cyanamide.

He said that the export of oil seeds from the State had been ruinous to agricultural prospects and that *harka* and *same* could well be replaced by oil seeds, such as groundnut.

Mr. Forbes said that the Government were considering the question of the local manufacture of cyanamide.

Mr. T. Narasinga Rao moved the following Proposition:—

Agricultural Education.

4. That this Conference is of opinion that agricultural education be further developed in all the grades by—

- (a) Raising the Hebbal English School to the status of a college and affiliating it to the University.

The President observed that the subject was under the consideration of Government.

Mr. Singri Nanjappa moved the following Proposition:—

- 4. (b) Increasing the number of Vernacular Agricultural Schools in the State.

The President said that the difficulty was in finding teachers and providing funds.

Dr. L. C. Coleman said that there was one vernacular school in Chikkanahalli and it was contemplated to start one in Chintamani. It all depended on the finding of funds and teachers. He said that if land-owners would give a piece of land in villages for practical instruction, it would be easy to start more schools in a few weeks.

Mr. G. Girimaji Rao said that he was quite willing to place a piece of land for the purpose at the disposal of the Agricultural Department.

Mr. H. Krishna Sastri said that intelligent students ought to be given agricultural education and not merely such as fail to do well in ordinary schools.

Mr. A. V. Nanjunda Setty moved the following Proposition:—

- 4. (c) Making Agriculture one of the compulsory subjects in all the rural schools.

Dr. L. C. Coleman said that he did not think that much good would result from making Agriculture one of the compulsory subjects. But at the same time he did not think that it would do much harm to give effect to the proposition. He was extremely keen on the question of developing primary education in rural areas on sound lines with special reference to the aptitudes of boys in villages. General primary instruction, itself, he considered, might have a leaning towards agriculture.

Mr. C. R. Reddy said that the co-operation of the Agricultural Department with the Education Department was necessary before proposals could be formulated on the subject.

The President observed that in the meantime they might give an agricultural bias to education in rural schools.

Mr. C. R. Reddy said that a Technical Assistant had been appointed to draw up text-books for use in lower primary and upper primary standards on science subjects. Much could not be done in the way of giving agricultural bias to education in rural areas at present and if they did so other subjects would be neglected. It would be more easy to introduce Agricul-

ture as one of the optional subjects in the Secondary School-Leaving Certificate Course.

Mr. A. Subramanya Iyer moved the following Proposition :—

Demonstration and Training.

5. This Conference is of opinion that there should be opened a demonstration farm in each Taluk, the entire cost of it being met from the State funds.

The President observed that demonstration farms must be shown to be commercially successful or in other words the farms should pay.

Mr. A. Subramanya-Iyer observed that that was not always possible. The farm could introduce new varieties and acquaint raiyats with improved methods of cultivation.

The President said that the subject might be further considered by the Committee.

Mr. A. Ramanna moved the following Proposition :—

Facilities for Development of Agriculture.

6. That this Conference recommends that in order to promote intensive and extensive cultivation of lands the following facilities be afforded by the Government :—(a) supply of water to lands under the channels in the months of March and April for growing manurial and fodder crops.

The President said that if the people were willing to pay, Government would have no objection to provide water.

Mr. A. Ramanna said that the principle of giving water free for the purpose referred to in the proposition had been accepted by Government.

The President saw no reason why the cultivator should not pay for the water if he was benefited by the supply.

Mr. A. Ramanna said that the Madras Government did not charge for water supplied for raising manurial and fodder crops.

The President said that Government could not afford to be uncalculating enthusiasts in the matter. The Government would be unjust

to the general tax-payer if water was supplied free for such purposes.

Dr. L. C. Coleman supported the proposition and observed that large increase in manurial production meant increase of revenue to Government. Government might charge for water supplied to new lands and give water free of charge to old lands.

The President said that the question would receive attention in connection with the report of the Select Committee of the Representative Assembly on the subject.

Mr. Girimaji Rao moved the following Proposition :—

6. (b) Giving facilities to Joint-stock Companies to establish sugar-cane plantations on a large scale in parts where canal irrigation is available.

The President said that the mover might submit his suggestions to the Committee for necessary action being taken.

The following is the note referred to above :—

Sugar-cane is one of the valuable crops which the agriculturist should grow if he wishes to have profits and obviously it is to the interest of the raiyats that they should grow valuable crops such as sugar-cane when they have water for irrigation. More facilities for irrigation have been provided in recent years, and it is necessary to see that the most profitable use is made of the irrigation facilities thus provided.

At one time, India was a sugar exporting country. In 1850-51, the exports were 79,582 tons valued at £1,823,789. But now we are importing sugar in enormous and increasing quantities every year. In 1904, 1905 and 1906 the imports of sugar were valued at 6.90 crores, 7.77 crores and 8.73 crores respectively. In 1912, the quantity of sugar imported came to 675,000 tons. From Japan, Java and Mauritius 722,694 tons of sugar in 1913-14, 399,170 tons in 1914-15, and 495,942 tons in 1915-16 were imported. In the sugar market of India, Japan has gained considerable ground with the stoppage of the imports of beat sugar

from enemy countries. The imports of sugar from Japan in 1913-14 were 131 tons, 704 tons in 1914-15, and 11,507 tons in 1915-16. The total area under sugar-cane in the whole of India is estimated at $2\frac{1}{2}$ million crores and the annual output of raw sugar at three million tons. In addition to this quantity, India imports from other countries various kinds of sugar aggregating some 800,000 tons. She pays nearly four lakhs of rupees a day for the imported sugar. There is, therefore, scope in India for the extension of sugar-cane cultivation, as at present the sugar produced in the country is insufficient and import is necessary to make up the deficit.

The war appears to give us an opportunity of becoming at least self-supporting with regard to sugar if we cannot export it. One of the difficulties in the way of a great extension of sugar-cane growing is the initial cost which involves heavy expenditure for manure and cultivation. If the raiyat is financed at a fair rate of interest, he could, by persuasion, be made to adopt more up-to-date methods of cultivation and to use increased quantities and suitable mixtures of scientifically prepared manures.

If the raiyats worked on a scientific system and were able to put more capital into the land, if every acre of land is as well cultivated as the best and if everywhere processes of manufacturing jaggery were equal to the practices of one or two men, the yield of jaggery will be more than twice than what it is now and the value $2\frac{1}{2}$ times as great. The present value of jaggery manufactured in the State is about Rs. 12,000,000, the quantity being about 100,000 tons prepared from cane grown on about 40,000 acres. By better methods of cultivation and better processes of manufacturing jaggery, the value of the sugar industry in Mysore will be raised, to three crores every year, from the present 12,000,000 Rs., even without the addition of a single acre of land to the area under cultivation.

Few raiyats grow sugar-cane in large areas. The cultivation is carried on in small patches. It is only under very large tanks and certain river channels that there is concentration of cane growing to an appreciable extent. The primitive methods of the old days have not given place to centralisation on a large scale. Though the wooden mills have been replaced by iron three roller mills, the strain on the cattle is very heavy and it takes as many as eight days and more to crush an acre of cane working day and night. The boiling of juice in open pans causes wastage of heat. The raiyat without co-operation finds it a heavy strain to cut cane and convert it into jaggery for the market. In many places there are professional cane millers who, in the season, go round the country to do this work. These millers, however, work in the same primitive way as the raiyats and their methods are equally wasteful. The employment of professional millers by no means relieves the raiyats of anxiety as the millers often make contracts that they are not able to fulfil. The cane is sometimes cut months after it has become ripe when it has lost its juicy content. The profits from cane cultivation are considerable when it is possible to avoid these difficulties, and these difficulties can be overcome on a large scale only by means of companies organized for the purpose. When the difficulties in the way of sugar-cane cultivation are overcome, the area under sugar-cane cultivation will probably increase. It would be an excellent thing if those who grow sugar-cane in one neighbourhood, each by himself, form themselves into a company each holding shares in the company proportionate to the area of the cane he cultivates. As a result of co-operation, a company can use power-driven mills. More efficient methods of evaporating juice may be adopted. It would give a larger percentage of jaggery of a much higher quality. In the matter of introducing better varieties of cane, in the use of manure, and in arrangements for drainage and irrigation,

a company would be able to do better than individuals.

In order to encourage the formation of companies of this kind, facilities will have to be given by Government, provided the companies agree to carry out sugar-cane cultivation according to the prescribed scale, to adopt scientific methods of cultivation and to manufacture jaggery according to improved methods. These facilities may take the following forms :—

(i) Financial help at a comparatively low rate of interest. At present it is doubtful whether loans and hire purchase agreements are intended to apply to Joint-stock Companies.

(ii) Irrigation facilities, *i.e.*, hot weather supply may be arranged for.

(iii) Free technical advice and help may be given by all departments of Government with regard to the cultivation of the sugar-cane, preparation of jaggery, obtaining of manures and of good varieties of cane. These facilities it may not be easy to give to individuals who grow sugar-cane in small patches, but they can be easily given to Joint-stock Companies who grow sugar-cane in fairly large areas.

(iv) Concessions granted to Co-operative Societies in respect of stamp duty, registration fees, remittance transfer receipts, and entry in the special notice register might be granted to Joint-stock Companies also.

As Mr. A. Ramanna observed yesterday, there seems to be a disinclination on the part of the raiyats to entrust their money to companies. But joint action is the only thing that will bring out improvement and the facilities now proposed, if offered by Government, will probably induce the raiyats to get over their disinclination and start companies in order to benefit by the concessions offered by Government.

In the address prepared by Dr. Coleman in February last for the District Conference at Kolar, he observed that the Kolar District takes at present the foremost place in the growing of sugar-cane in the State, although

he doubted whether the premier position will be kept up for long. With respect to river channels, Kolar District now takes the third place in the State having 107 miles of channels, as compared with 837 miles of the Mysore District and 202 miles of the Hassan District. The area under sugar-cane cultivation in the Kolar District is nearly 9,000 acres while in the Mysore and Hassan Districts it is less than 7,000 acres.

In conclusion, I beg to move that facilities may be given to Joint-stock Companies to establish sugar-cane plantations on a large scale in parts where canal irrigation is available.

Mr. Nadig Bhaskar Rao moved the following Proposition :—

6. (d) Grant of concessions by way of remission of assessment to raiyats in the Shimoga District who undertake to raise fruit and cocoanut gardens on not less than one acre of the lands belonging to them.

The President asked the mover to send up proposals to the Committee.

Mr. T. Narasinga Rao moved the following Proposition :—

6. (e) Abolishing the rule prohibiting the cultivation within 50 yards on either side of streams.

The President asked the mover to bring up the proposals at the Representative Assembly.

Again Mr. Narasinga Rao said that this was a vexed question which left much valuable land unused and all that he would request the Government to do was to keep the question open for discussion at the ensuing session of the Dasara Representative Assembly.

Mr. R. T. Mahadeva Rao moved the following Proposition :—

6. (g) Formation of Cotton Growers' Associations, wherever possible, in Taluk headquarters, with financial help, if necessary, to encourage cotton cultivation.

The following is a brief summary of the

proposal put forward by Mr. R. T. Mahadeva Rao:—

For the benefit of the cotton growers it is necessary to establish a Cotton Growers' Association for each cotton growing Taluk or for a group of such Taluks.

A. Objects of the Association :—

- (1) To educate the people in the improved methods of cotton cultivation so as to obtain maximum yield.
- (2) To secure to them proper supply of seed.
- (3) To enable them to procure the best price for the produce.
- (4) To hold periodical conferences and exhibitions to concert measures to achieve the above objects.

B. Membership :—

- (1) All cotton growers in the area comprised within the jurisdiction of the Association will be eligible to become members.
- (2) Each member will pay a fee of As. 2 per acre.
- (3) None but members will receive the benefits of the Association.

C. Management :—

- (1) There will be a Committee or Board of Directors to manage the Association and fulfil its objects.
- (2) The Board will consist of 15 members elected by the members in their general meeting. It will consist of the President, the Secretary and ordinary members.
- (3) The Board will employ a Manager, a Cashier and a number of clerks as may be necessary for the work of the Association and shall keep control over this executive staff.
- (4) The Board shall meet once a month and shall scrutinise the accounts and the work of the executive staff.

D. Duties of the Executive Staff :—

- (1) To impart instruction to the cotton growers,

- (a) in the use of improved agricultural implements ;
- (b) in the selection, preservation and use of manure ;
- (c) in the selection and use of seed ; and
- (d) in the selection of suitable lands for particular varieties of seed.
- (2) To open implement, seed and manure depôts wherever necessary.
- (3) To study the cotton market and to act as medium between the growers and the purchasers.
- (4) To issue bulletins for the information of the members to carry out the objects of the Association.
- (5) To attend to all correspondence, keeping of accounts and other office work.

E. Other Matters :—

- (1) A small profit may be charged solely with the object of meeting the charges of the establishment on sales of implements, seeds and manure.
- (2) A brokerage may be charged for securing highest prices to the cotton growers for the cotton they grow.
- (3) Large purchasers should be secured and the cotton grown by members should be collectively used to meet the demands of such purchasers.
- (4) The cotton growers will be saved from much loss in weighment and miscellaneous charges they are now bound to meet.
- (5) The Association can create facilities for the transit of cotton from the place where it is grown to the office of the Association and further on.
- (6) The objects of the Association are manifold and they are all for securing increased yield and increased profit to the grower.
- (7) The funds of the Association through fees and other sources may not suffice for its expenses. Hence the

Government is to be requested to sanction a grant-in-aid and also give the services of an expert Agricultural Inspector to impart instruction to the growers and to train them well in cotton cultivation.

- (8) Necessary rules and by-laws may be framed and a Committee may be appointed for this purpose.

Mr. Mahadeva Rao asked that the subject might be transferred from the Agricultural Committee to the Industries and Commerce Committee for consideration.

The President said that the suggestion might be carried out.

At this stage the Conference rose for the day adjourning the sitting to 12 noon next day.

THIRD DAY'S PROCEEDINGS.

WEDNESDAY, 19TH JUNE.

THE Conference resumed its sitting at 12 noon and the proceedings of the day related to Confidential Subjects.

FOURTH DAY'S PROCEEDINGS.

FRIDAY, 21ST JUNE.

THE Conference resumed its sitting at 12 noon, Sir M. Visvesvaraya presiding.

Education, Organization, etc.

The discussion on Confidential subjects was resumed. This over, Mr. C. R. Reddy moved the following Proposition:—

1. That with a view to giving a practical bent to a purely literary education this Conference recommends—

- (a) That all schools be of the polytechnic

type enabling students taking Agriculture and such like subjects to go up to University Degrees.

He said that High Schools should take up polytechnics. He had worked up a scheme under which the following subjects would be made compulsory, *viz.*, English, Vernacular, Elementary Mathematics, Indian History and Elementary Science. The optional groups would consist of English History, Economics, Physics, Chemistry, Natural Science and Sanskrit, Cabinet making, Smithy, Printing, Bookbinding and Weaving. It was expected that a full three years' course would be provided. If they intended to further intensify vocational culture, four hours now set apart for Sloyd and Kindergarten course might be utilised for technical instruction. They should study the conditions of each locality and make provision for the study of Agriculture and Sericulture in appropriate places and other subjects. The cost according to local conditions of the scheme worked out at five lakhs non-recurring and rupees one lakh and twenty thousand recurring expenditure. Without in any way upsetting the development of the existing schools they could convert them into polytechnic schools. The cost might look high but it was not unduly high considering the advantages to be derived. There were three hundred to four hundred scholars in the Bangalore High School. This year they had allowed Commerce to be taken up as an optional subject so as to introduce a vocational subject. He was told that students had come from mofussil stations and that about thirty students had selected Commerce as a vocational subject. In the next three years the total number of students taking up Commerce would be nearer hundred and fifty than hundred. He had no hesitation in saying that out of two thousand students in all the High Schools about 1,500 would go in for the vocational course without depriving themselves of the opportunity of cultural studies inasmuch as compulsory subjects gave sufficient scope for training in Science and the humanities. By the time the proposed organization was completed the University

would have organized its course of Agricultural training. There was nothing to prevent the University from organizing other courses belonging to the Technological Department. Students who passed from Secondary School-Leaving Certificate might go up to B.A. and specialise in the vocational branches. A fruitful association would thus be established between professional course and general education. He meant to call a small Committee to consider the scheme and he requested the Conference to affirm the principle of the scheme.

Mr. A. K. Yegnanarayana Iyer observed that he had suggested a somewhat similar scheme for the Lower Secondary Course. Many students stopped their education with the Lower Secondary Course and he wanted that such students ought to be equipped with some vocational training.

Mr. C. R. Reddy observed that it was only as a matter of expediency that he suggested his scheme for High Schools. The average age of a boy entering the High School Course was 12 and that was the proper age for introducing vocational training.

Mr. A. K. Yegnanarayana Iyer observed that practical instruction classes might be developed so that instruction might be in graduated courses for the 3rd, 4th and 5th classes. They had made a beginning already and in the case of Agriculture they had commenced a system of giving instruction in three years. The question of providing teachers would be one of very great difficulty but the experiment might be tried in some select places where there were industrial schools.

Mr. A. Ramanna observed that about twenty-five years ago he had made a similar proposal. It did not meet with favour then because the time was not ripe for such ideas. Now he was glad to see the Inspector-General of Education putting forward a proposition of this sort. He supported the proposition and hoped that the Conference would give its support to such a practical proposal.

Mr. M. Venkatakrishnayya observed that primary education in the form of agricultural

and industrial instruction might be given to students by means of Kindergarten lessons. The disinclination of parents should be overcome in the first instance and only then would primary education become more diffused.

The President said that the scheme might be placed before the Committee and the details worked out by them. To the lowest grades of vocational education even the illiterate might, where necessary, be admitted, and some special arrangements to give them suitable training. He also suggested that a list of men requiring to be trained in the various vocations and professions should be prepared and maintained, and systematic efforts made to train them.

Mr. K. Krishnamurthi Rao moved the following Proposition:—

3. That for the expansion and encouragement of Primary Education this Conference recommends:—

(b) That to enable the timely disbursement of salaries to masters of Village Elementary Schools, a suitable imprest may be placed at the disposal of Patels who may be directed to disburse the pay or allowance on the first day of the month and recoup the imprest amount by presenting bills to the Treasury.

Mr. M. Shama Rao observed that in Dharwar the village school-master was paid through Patels.

Mr. Mir Humza Hussain observed that the practice of paying school-masters through Shekdars led to malpractices and he himself had tried and convicted one or two men.

Mr. K. Krishnamurthi Rao suggested that school-masters might be asked to go to Taluk headquarters on the first or second Saturday to get their salaries. The difficulty was now about Inspectors granting leave to school-masters. Acquittance rolls might be sent to the Taluk Office before the 5th of the month.

Mr. M. Chengiah Chetty said that an imprest might be left with the Patels and they might be asked to disburse the salary to school masters.

The President observed that the giving of money to Patels for the purpose was strongly objected to.

Mr. K. Matthan observed that grant-in-aid schools might be paid by the Village Committees which were responsible for the maintenance of such schools. If funds were misappropriated there was the Criminal Law.

Mr. Mir Humza Hussain said that as the matter had not been placed before the Education Committee it might be referred to them.

The President said that the Committee would consider the subject.

Secondary and University Education.

Mr. M. Venkatakrishnayya moved the following Proposition :—

4. This Conference is of opinion that :—

- (a) Government should be requested to secure recognition for the Collegiate Entrance Examination of the Mysore University as the qualifying test for admission to the Technical Examination of the other Indian Universities.

The President observed that as the matter was now under correspondence, in the interest of the student population it should not be discussed at this stage.

Development of Education in all the Grades and Compulsory Education.

Mr. C. R. Reddy moved the following Proposition :—

- 6. That in order to develop education in all the grades and among all the different communities in the State this Conference is of opinion that it is necessary to create the following facilities, viz. :—

- (a) Special efforts to be made to promote and encourage modern literature in Kannada.

He said that he was happy to state that some of the foremost scholars had consented to write books in Kannada. He had promised and in order to keep Government informed of the progress made he sent a report to Government sometime ago when he asked for a special allot-

ment in the Budget. The problem was one which could be solved if there were funds. The subjects on which books were proposed to be written were History, Philosophy, Logic, Physical and Natural Science, Mathematics, Applied Sciences, Hygiene, Physiology and Geology. Mr. H. Narayana Rao of the Presidency College, Madras, had undertaken to write some books. Some of them had not stipulated for any terms for writing the books. Many of them knew more than one language and that being so they would try to produce something original and not produce some patch-work made from the existing books. The books he referred to were those for the Entrance Class Standard.

Mr. M. Venkatakrishnayya observed that the Inspector-General of Education and the Chairman of the Education Committee might appoint a Board and call upon those who could come forward to write books. The writing of books was now entrusted to people in a most promiscuous manner.

Mr. Mir Humza Hussain observed that it was not known what the Kannada Academy had done in the matter of encouraging the study of Kannada literature. There would be a lot of discontent among Mysoreans if the whole patronage in the matter of writing text-books was given to persons outside Mysore. He suggested that patronage should be given to local talent.

The President observed that there was no reason why they should not encourage local talent.

Mr. C. R. Reddy pointed out that among those who had undertaken to write books there was only one gentleman who was an outsider.

Mr. M. Venkatakrishnayya moved the following Proposition :—

- 6. (b) Primary, Secondary, and University Education should be made free.

He said that they were likely to raise rupees thirteen lakhs by the levy of income-tax and that sum might be utilized for giving effect to the proposition.

Mr. K. P. Puttanna Chetty observed that primary education had only been recently made free. There was a strong consensus of

opinion that the money taken from the people must be utilized for purposes beneficial to the people and secondary and university education were not so beneficial to the general masses of the people as primary education.

Mr. K. Matthan observed that the proposal must be taken as coming only as a counsel of perfection and it should be kept as the goal in view.

Mr. Mir Humza Hussain observed that the Senate of the Mysore University by a large majority resolved recently that higher education must be made free so far as the arts course was concerned. In India education had commenced from the top and not from the bottom. It was not primary education or secondary education that was developed first in India. Did anybody think that India would have progressed so much if attention had been paid to primary education alone and not to higher education? If they took care of the head all the limbs of the body would perform their functions all right. Having regard to the small cost involved in giving effect to the proposal, *viz.*, the loss of a fee income of Rs. 80,000, and the benefit the country would derive from higher education and the opportunity it would give for men of exceptional talent who could not take to higher education through poverty, every one should support the proposal.

Mr. M. Subbiah observed that primary education ought to receive the first encouragement from the State.

Mr. G. Girimaji Rao said that he was in favour of making education free in all the three grades. He believed that there would be sufficient money from the levy of income-tax to enable them to give effect to the proposition.

The President observed that the solution of the question would depend on the finding of funds.

Mr. A. V. Nanjunda Chetty moved the following Proposition:—

6. (c) Free and compulsory education should be introduced into all the rural parts of the State.

He said that at any rate teaching in the grant-in-aid schools must be made free.

Mr. Veene Rangaswami Iyengar said that it

was the paramount duty of the paternal Government to afford equal facilities for education to the rich and the poor alike.

The President said that it was a question of funds and that effort would be made to keep the object in view as far as funds were available.

Professional Education.

Mr. C. R. Reddy moved the following Proposition in the absence of the Rev. E. W. Thompson:—

7. This Conference recommends:—

(d) That Pedagogics be made one of the optional subjects in the arts course in the University and a compulsory subject for the Vernacular Upper Secondary Examination.

He said that the object of the proposition was to afford greater facilities to persons who might wish to take teaching as an optional subject to qualify themselves to become teachers. According to the present curriculum it was quite possible to take up teaching as an additional subject while acquiring sufficient knowledge of English and other subjects.

Mr. Mir Humza Hussain observed that there was no unanimity of opinion in the Education Committee on this subject. It was decided in the Mysore University Council that Pedagogics should not be made a subject in the B.A. course. Now the opinion of a distinguished educationist was brought forward in support of the proposition. In the present condition of things he was of opinion that in India Pedagogics ought not to be made an optional subject and that it must be reserved for post-graduate study.

Mr. C. R. Reddy observed that the University Council did not vote for the proposal. What he said was that students of all grades and various ages should take up Teaching as one of the optional subjects. If teachers were wanted for Training Colleges they might undergo training in the M.A. Course itself.

Education of Women.

The Shimoga District Committee placed the following Proposition:—

9. (b) That in order to popularise and improve female education in the State.

this Conference considers it necessary that education should be made compulsory for girls in taluk head-quarter towns.

Mr. A. Ramanna opposed the Proposition and said that it was most dangerous to make education for girls compulsory. He was in favour of the education of girls but he was of opinion that it should not be made compulsory. In a matter like this reforms should be introduced gradually. The time was not ripe for compulsory education of girls. At present greater attention should be paid to Men's education which would be more immediately productive of benefit to the country.

Mr. R. Gopalaswami Iyer pointed out that in England and France women were taking as important a part as men in the various walks of life.

The proposition was put to vote and carried by a majority, 27 voting for and 8 against it.

Mrs. K. D. Rukminiamma moved the following Proposition :—

(f) Extending the Upper Secondary Courses for women by one more year and increasing the range of optional subjects.

(g) Making drawing compulsory and introducing industrial subjects as optional subjects for the Vernacular Middle School Courses for girls.

In doing so she said :—The proposition I am moving to-day is a very simple one. It is that industrial and domestic subjects be introduced as optionals in the vernacular courses of study for girls, and that a literary side be opened in the Home Industries classes for women.

It is often said that the education our girls receive in the lower grades is not practical. The charge brought against it is that it is too literary to be of any practical use to the girls. It must be admitted that mere manual training without even a rudimentary knowledge of the three R's is a purely mechanical and one-sided development which whatever its material advantages may be, is of very little educative value. So the proposition aims at combining a course in industrial and practical instruction

with the imparting of literary knowledge also.

Our Home Industries classes for women have been in existence for some time, and they may easily be converted into centres for the spread of general knowledge of practical utility to our women by organizing a system of instruction comprising a knowledge of the three R's and general lectures on Hygiene, Sanitation, Domestic Economy, Sick-nursing, Care of Infants, etc.

On the other hand, the introduction of Industrial and Domestic subjects into our Lower Secondary and Upper Secondary Schools, will help such of the girls as have no idea of qualifying themselves for the teacher's profession to get some sort of practical training, which may be of use to them at home when they leave off going to school.

There is a certain amount of duplication in the two systems which, I think, cannot be helped. However, there is a great difference also between the two. In the Home Industries classes which are chiefly intended for the benefit of adult women, the industrial and practical side of education is emphasised ; while in our girls' schools prominence is given to literary instruction. The two should be kept quite separate although the end in view is the same.

So much as regards giving our women, who have neither the liking nor the means to enter on higher course of studies, some industrial and practical training which will enable them to make themselves more useful to their families. But this should not obscure the main ideal to be kept steadily in view, namely, the promotion of the spread of culture among the generality of our women by every means in our power. They must be made to understand that there is a wider sphere beyond the narrow circles of their homes in which each one must play her part, if the country is to keep abreast of modern progressive nations. This can be done only by affording our women equal facilities along with men in the matter of their education. It will not do simply to prescribe that their training shall be limited to their being brought up to be "*good wives and wise mothers.*" Our wo-

men have long been regarded as perpetual invalids, to whom education is to be administered in small and bitter doses, and the result has been a stunted growth of the feminine intellect. In the matter of education, you cannot say thus far and no farther. Women should be allowed the freedom of choice as regards their educational ideals. Unless our men give up their "goods and chattels" view of our women—and I was rather surprised and pained to listen to the expression of such sentiments in this Assembly the other day—unless our men begin to have better and higher opinion of women than of consigning them to a mere animal existence, I am afraid there can be no salvation for our motherland.

Mr. Mir Humza Hussain observed that a scheme was discussed and sent up to Government two years ago by the Education Committee and no orders had been passed. In the Home Industries classes it was not easy to introduce the imparting of general education. Those classes were intended for the benefit of adult women.

Mr. C. R. Reddy said that there was a proposal to bring out suitable text-books for Lower Primary and Upper Primary Schools in Science subjects.

Education of Backward and Depressed Classes.

Mr. M. Venkatakrishnayya moved the following Proposition :—

10. (d) This Conference recommends that a grant of rupees one lakh be sanctioned for building and equipping boarding houses for the depressed classes at all District head-quarters and another lakh of rupees for their maintenance.

Mr. C. R. Reddy said that the Government had already sanctioned a sufficient grant for the purpose referred to in the proposition.

Miscellaneous.

Mr. M. Chengiah Chetty moved the following Proposition :—

12. (d) That the too frequent transfers of teachers in the Anglo-Vernacular

Schools which have been detrimental to the boys studying therein be checked and that adequate steps be taken to provide promotion for these teachers by a suitably devised time scale.

The President said that the Department would note the suggestion.

Mr. H. Rangaswami Iyengar moved the following Proposition :—

12. (j) That such of the backward communities as cannot get any scholarships owing to their numerical smallness be assigned a definite number of scholarships.

The President said that the matter was under the consideration of Government.

AGRICULTURE.

Mr. R. Gopalaswami Iyer moved the following Proposition :—

Colonisation and Labour Supply.

7. That with a view to induce settlers in large numbers to take up lands under the big reservoirs and in the *malnad* parts of the State and to ensure a steady supply of agricultural labour this Conference considers it necessary.
- (a) That settlers should be attracted by the offer of liberal concessions, *viz.*, giving each family a minimum extent of dry and wet lands, an advance of one or two years' working expenses to be recovered in easy instalments later on and free medical aid.

He said that lands should be given in one area and not five acres in one place and another five acres in another place. He added that men who had undergone a course in agriculture, and were eager to turn their knowledge to account should be given an opportunity of getting sufficiently large blocks of land to make it worth their while to take up practical farming as their work in life.

Dr. L. C. Coleman said that he had sent up proposals to Government in the matter. In

connection with the Development of Agricultural Education there was the question of starting an Agricultural College. If men attending the College were likely to go back to their lands and put the training received in the Agricultural College to practical use, Government would have to give special facilities for such men to have sufficiently large blocks of land to cultivate to enable them to derive a sufficient income therefrom.

The President observed that the subject might be referred to the Agricultural Committee.

The Tumkur District Committee placed the following Proposition :—

7. (d) That a Labour Enquiry Bureau be established to recruit and supply ordinary labour of all kinds.

The President said that a Sub-Committee of the Conference might go into the question of emigration and labour supply.

In connection with the above subject the President asked for the opinion of the Conference with regard to the desirability of passing a legislative enactment prohibiting able-bodied men from begging.

The proposal was put to vote; 32 voted for the proposal and 2 against it.

Improvement of Agricultural Stock.

Mr. B. Venkoba Rao moved the following Proposition :—

8. (a) That this Conference is of opinion that the question of improvement of agricultural stock deserves urgent consideration at the hands of Government and recommends that a Commission be appointed to study the stock growing problems of the State.

Mr. Zahiruddin Meccai observed that cattle shows were held in several places but people brought cattle more for sale than for exhibition. The Government might introduce a system in order to encourage people to hold cattle shows every year and substantial prizes should be given. The best exhibitor may be given a breeding bull instead of a silver cup or money prize as now.

Fuel and Manurial Plantations.

Mr. B. Venkoba Rao moved the following Proposition :—

9. (b) This Conference considers that steps should be taken to promote afforestation by inducing private people, by the grant of loans on easy terms, if necessary, to plant trees in a systematic manner in water-catchment areas in the *maidan* parts of the State.

He said :—In the *maidan* districts the question of fuel supply is assuming an acute form. Everybody is aware of the present abnormal prices of fuel. This might be due to extraordinary causes. But even after the normal state of things is restored, it is feared that the price of fuel would still be high comparatively. There are other circumstances which might cause an increase in such high prices. We are now on the eve of starting the Iron industry in the State. The Economic Conference has given a great stimulus to industrial development. It will not be long before several important industries come into existence. Many of these industrial concerns which may use steam power, would require large quantities of firewood. Therefore, it behoves us to see that afforestation is largely promoted.

Appendix 'H' of the Land Revenue Rules contains rules for the grant of waste and unoccupied lands for the planting of timber, fruit, and fuel trees. The Agricultural Committee have proposed certain amendments to these rules. With the said changes the rules are likely to become popular. What is required is a publication for each taluk of a list showing the blocks available to be taken up under the rules contained in Appendix 'H.' The selection of the lands should be carefully made with the help of the Forest Department. The lists will have to be approved by the Deputy Commissioner so that Dharkasts could be speedily disposed of. The aforesaid rules might apply to the planting of the trees in water-catchment areas as well. There will be some cases in which the rules mentioned in Appendix 'H' might not be applicable to the planting of trees in such

areas. In these cases free permission should be given for the planting of trees to a single individual or a number of individuals jointly. No assessment should be charged. The person or persons concerned should have the exclusive right to the loppings and usufruct of such trees. They should also be entitled to dead wood but should not cut or otherwise injure live trees. Till the trees mature they should have the right of enclosing the land for protection. The place should be thrown open to the villagers and their cattle for shelter after the trees attain a stage at which they are free from the ravages of cattle. There should be a complete record of rights showing the ownership of the trees, etc. A system of prizes and merit certificates might be organized for the best tree planting in water-catchment areas. To encourage such plantations and with a view to speedy afforestation loans might be given on easy terms similar to those granted under the Land Improvement Loans Regulation.

Apart from the climatic point of view the planting of trees in general is of vital importance for various considerations. The systematic planting of trees in water-catchment areas in the *maidan* parts of the State has got the additional advantage of the prevention of the silting of the beds of tanks.

The subject was referred to the Agricultural Committee for further action.

Rao Saheb Mr. M. Rama Rao moved the following Proposition :—

9. (a) This Conference recommends that steps should be taken to form fuel plantations of quick growing kinds such as *Casuarina*, *Eucalyptus*, etc., on either side of the Bhadra river from Lakkavalli to Benkipur and that a competent officer should be deputed to investigate the subject and work out a practical scheme.

He said that for the past 25 years there had been no encouragement for the plantation of topes or for growing fuel. The Industries Department consumed a large quantity of fuel. In all channels there were bunds and reserve

lands. Permission might be granted to people to grow honge and to take the produce without payment of the revenue to the State.

Mr. A. Ramanna moved the following Proposition :—

9. (d) This Conference considers that steps should be taken to encourage honge plantations by supplying seed gratis and grant of bonuses according to the area planted.

The President said that it would be better if the proposal came in the shape of a scheme from the Committee.

Sericulture.

Mr. T. Narasinga Rao moved the following Proposition :—

10. (c) That with a view to expand Sericultural operations in the State this Conference urges upon the Government the desirability of forming mulberry plantations in suitable areas in the State through the agency of the Forest and other Departments—a beginning being made by starting such plantations in the Kadur and Hassan Districts.

Mr. T. Narasinga Rao in moving the proposition said that the silk industry of the State had a great future before it. Experts had established beyond doubt that very successful crops could be got with univoltine eggs in the Kadur District. The work done there had impressed the raiyats, and a good beginning had already been made. It was, however, incumbent on Government to form mulberry plantations in suitable areas, so that in course of time it might be possible to develop work on lines similar to those adopted in Kashmir. This work needed some time, and was one for Government to take up, especially as suitable lands were under the control of Government. He doubted whether the Sericultural Department had staff enough at present to undertake this planting work on a large scale, and thought that the Forest Department which had both an organized staff and lands should raise plantations of mulberry, and hand them over to the

Sericultural Department. This would be adding to the national wealth, as mulberry was a good timber and fodder tree also.

The President said that the Committee would note the suggestion.

At this stage the Conference adjourned for Lunch.

After Lunch.

The Conference resumed sitting at 3-30 P.M.

The Secretary announced the names of the members elected to the Conference and also the members of the three Central Committees.

The President then called upon Mr. N. Rama Rao to explain the need for encouraging the installation of an up-to-date filature in Mysore in connection with the following Proposition:—

10. (i) Encouraging the establishment of an up-to-date filature by guaranteeing a return of 5 per cent on the invested capital for a period of five years.

Mr. N. Rama Rao said that the value of the present output of silk in the State was about 60 lakhs of rupees. He believed that with suitable facilities and direction it was possible to treble the silk production in the course of five years. He had made definite suggestions as to the action necessary to foster the industry and believed that to develop the industry, a study of the market for silk was essential. There was no doubt that the cost of production could be reduced, and the quality of the raw silk improved by better reeling which was of the first importance, especially if they were to compete with Chinese and Japanese silks. These latter, though otherwise not as good as the Mysore article, were better reeled, and so were preferred by weavers. With the greatly increased production of cocoons that was expected, it was necessary that the raw silk should be of a quality which would sell in a larger market. Signor Mari, the late Director of Sericulture, was of opinion that the whole system of reeling in Mysore should undergo a radical change, and that the hand-reeler should be displaced by a filature. It was, however, considered inadvisable to bring about a sudden dislocation

of trade, which would be sure to hit the reelers very hard, and in the meantime, the war made all projects involving import of machinery impossible of execution. Signor Battaglia, the Italian Engineer, who had studied Mysore conditions with a view to evolve a specially suitable type of filature had written that till the close of the war he could do nothing for them. By the time machinery became available it was likely that the output of cocoons would be sufficiently increased to soften the competition of the filature with hand-reelers. Government had recognised the need for a filature, and immediately before the war broke out, had quite decided to import one. In case private enterprise was forthcoming to pioneer this business, it deserved to be encouraged by all reasonable concessions. Roughly speaking, the initial expenditure would be close on Rs. 75,000, and over two lakhs would be necessary for working expenses. Considerable initiative, and great powers of organization would also be required. The business would take about five years to settle down into a regular course. What was proposed was that Government should guarantee a return of 5 per cent on the invested capital for five years, which, considering the fact that the concern, would pay well almost from the first year was by no means an extravagant concession to ask for.

Mr. M. Chengiah Chetty asked whether Mysore was likely to oust China and Japan from the silk market.

Mr. N. Rama Rao said that ousting foreign silk was a big proposition, but that he had no doubt Mysore could sell all its silk to advantage in India, and had nothing to fear from the competition of the foreign silk. They had, however, to establish and maintain a standard by obtaining control over one or two large reeling establishments.

Horticulture.

Mr. M. Subbiah moved the following Proposition:—

11. That this Conference recommends that a separate department for the expansion of fruit cultivation and the development of industries connected therewith

be formed with the existing horticultural staff as nucleus and that the work continue to be under the control of the Agricultural Committee for the present, an Honorary Superintendent being appointed to co-operate with the Secretary.

He said that arrangements for purchasing plants were now very defective. Only two districts had made some efforts. District and Taluk nurseries must be formed. If they could raise a large number of plants and vegetable seeds and sell them to people it would serve as a very useful demonstration. The Lal-Bagh authorities did not co-operate with the Agricultural Committee and it was necessary that the Superintendent should be invited to co-operate with the Agricultural Committee and bring about improvements. Arrangements should also be made to grow medicinal herbs in the Sunnakal Farm.

Mr. R. Gopalaswami Iyer said that arrangements to provide drainage and wells would help the growth of plants. They could raise good seed on scientific principles and sell them to people. If they wanted to improve the cultivation of fruit trees the Agricultural Department or the Lal-Bagh authorities should take up the work.

The President said that the subject would be considered by the Committee.

Mr. Mir Humza Hussain moved the following Proposition :—

Miscellaneous.

5. That as a knowledge of Economics is necessary for the officers of the Revenue and Commerce Departments an examination in Economics and the Industrial History of England be instituted as a branch of the Local Service Examination.

He said that Officers ought to know the industrial side of questions dealt with by them. The Revenue Officers could have in future more time at their disposal by the separation of Judicial from executive functions, which time might be utilised for studying economic questions.

The President said that the subject might be discussed in the Committee and that a scheme might be elaborated.

Mr. Mir Humza Hussain moved the following Proposition :—

6. That the following additions to and revision of the statistics now published be given effect to :—

- (a) Statistics showing the number of holdings of different sizes paying kadayam to Government in different amounts classified according to the communities and sub-communities.
- (b) Judicial statistics to be so revised and reviewed as to give an idea of the economic condition of the people.

He said that the importance of judicial statistics had not yet been sufficiently recognised. One of the points in the scheme was that they should devise methods of relieving indebtedness. Much of the indebtedness of raiyats was for sums below Rs. 2,000. Judicial statistics showed that the number of suits for recovery of small sums was very small. Another question to be considered was whether increased litigation was proof of the prosperity of people or whether it was due to distress and want. There were suits for breaches of contract. There was again the question whether those suits were proof of the fact that the commercial morality of people was low or whether the people were not able to fulfil their contracts on account of adverse conditions. Judicial statistics would throw much light on those points.

The President said that these were points of research into the economic condition of the people to be taken up after more essential information was collected.

Taluk and Town Progress Committees.

Mr. M. A. Narayana Iyengar moved the following Proposition :—

3. That in regard to the several Taluk and Town Progress Committees it is necessary
 - (b) that the members should be paid

travelling allowances at rates allowed to Taluk Board Members.

He said that the cost would amount to about Rs. 10,000. If the grant to Taluk Progress Committees could be raised to Rs. 250 the Committees themselves would raise another Rs. 250.

The President invited suggestions from members about methods of getting the best results from the work in the coming year.

Mr. R. Gopalaswami Iyer suggested that essentials should be separated from non-essentials in the list of subjects to be taken up for investigation in the coming year.

The President said that the separation of essential subjects from non-essential subjects might be left to the Committees.

Mr. M. Subbiah suggested that every Taluk Committee should have a non-official Secretary and that the Economic Superintendents must attend the Taluk Progress Committee meetings.

The President said that the Deputy Commissioner should see that only members who attend the meetings regularly were continued as members of Committees.

The Secretary then read the list of names of persons who had done good work during the year.

The President observed that if the Government wanted some statistics about any particular matter it was not now possible to get them at short notice. It was necessary therefore to have enumerators in the various places to collect statistics so that Government might be able to get information in a fortnight's time.

Mr. K. Matthan pointed out that postal facilities at present were not sufficient and hence information could not be collected in such a short time as a fortnight.

Mr. M. Venkatakrishnayya moved the following Proposition :—

General Conference.

2. That as the Mysore District is the biggest in the State and the work likewise heaviest an Assistant Economic Superintendent be appointed for that Dis-

trict to assist the District Economic Superintendent.

The subject was noted for consideration.

Mr. K. Krishnamurthi Rao suggested that the Chairmen of the three Central Committees and the President of the Economic Conference might be elected in future.

Mr. A. Ramanna objected to the proposal and said that he had compared the constitution of certain Economic Bodies in Western countries with the constitution of the Economic Conference in Mysore. The Conference on the official side was here represented by the executive Government of Mysore. Government itself had taken the lead in economic matters and had been doing its best to see that there were substantial progress in the shortest possible time. There were institutions in other places where people passed resolutions and submitted them to Government and the information thus placed before Government was not first-hand information and Government had no opportunity of correctly gauging the feelings and sentiments of the people. Consequently progress in those cases must in the very nature of things be slow. The object of the Economic Conference in Mysore would not be served but would on the other hand be defeated if Mr. Krishnamurthi Rao's suggestion was accepted. To accept such a proposition would cause a great injustice to the interests of the people and as a representative of the people, he was of the opinion that the opportunity such as they had now of making an effective representation of grievances to those who had the power of deciding matters finally must be continued.

Mr. M. A. Narayana Iyengar said that the time had come for them to admit certain general principles so that there might be an attempt at sufficient co-ordination of efforts in economic matters. Taluk Committees and Village Committees had come to such a stage that in each taluk they found about a hundred or two hundred workers to start schools or co-operative societies or to dig wells, each effort being valuable in its own way. That spirit on the part of the people should be encouraged. He, therefore, suggested that the services of such people

should be recognised in this Conference. In his district he gave each Taluk Conference a constitution and he gave power to vote at the Taluk Conferences to members who paid a subscription of one rupee. He suggested that at least two representatives might be selected from each district to sit in this Conference. In his opinion there ought to be in the Conference at least five members from his district and every district must have its due share of representation on the General Conference and on the Standing Committee.

The Secretary then read out the result of the election of five members from the Conference for each of the Committees and the names of the members of the Committees for the coming year. The President then announced that Sirdar Kantaraj Urs would be the Chairman of the Agricultural Committee, Mr. P. Raghavendra Rao of the Industries and Commerce Committee during the absence of Mr. Banerji, and Mr. Chakravarti of the Education Committee.

This concluded the discussion of subjects.

Rajamantrapravina Diwan Bahadur Mr. J. S. Chakravarti, M.A., F.R.A.S., Chairman of the Education Committee, summing up the debate on educational subjects said :—

MR. PRESIDENT AND GENTLEMEN,—According to established practice, it is now my duty and my privilege to sum up the main features of the debates that have taken place on educational subjects in this session of the Conference. But before I do so, I wish to take this opportunity of acknowledging before the Conference the valuable help that I have received from all my colleagues in the Education Committee during the year under review. While the members as a body took a general interest in all propositions brought forward at the meeting of the Committee—and it is well known that our discussions have not only been interesting but at times animated and exciting—each member kindly undertook to study some special subjects and carry out some specified items of work according to the pre-arranged programme. On Mr. P. Raghavendra Rao and the Backward Classes Scholarships Sub-Committee over

which he presided, devolved the difficult and delicate task of framing the rules and organizing the work connected with the administration of these scholarships. Our best thanks are due to the sub-committee and its able and tactful President for the work they have done in this connection. I am also glad to acknowledge the very useful work done by Mr. Thompson on the sub-committee. The scholarships of the three lowest grades—and these were the most numerous—had to be administered through the District Committees and the Taluk Progress Committees and considering that these bodies have been newly constituted and that our local committees are not accustomed to responsible administrative work of this nature the working of the scheme may be regarded as highly successful. There might have been errors and omissions here and there but they are unavoidable when a new scheme had to be worked through popular bodies newly constituted. It cannot be denied that the administration of these scholarships through the District Committees and the Taluk Progress Committees was a valuable step in advancing the education of the people in managing their own affairs.

During a part of the year under review, Mr. K. R. Srinivasa Iyengar was Chairman of the Committee of management of the Home Industries Institute at Bangalore; he did much to reorganize the work of this useful institution, and the working of the classes controlled by it. Most of you will remember the lucid and spirited speech in which he explained to you last year the real aims, objects and methods of work of this institution. The Committee is now presided over by Rajakaryaprasakta Rao Bahadur Mr. M. Shama Rao whose ripe experience and sound judgment is a guarantee that the institution will continue to develop on right lines and to achieve the great economic and educational ideal, which the Home Industries movement has before it. Mr. Shama Rao has also taken up the question of educating adult women in the most suitable manner and interesting experiments in the way of holding afternoon classes on popular lines for this

section of the population are going on in the City of Bangalore under his guidance.

Mr. Reddy's help has been invaluable in co-ordinating the work of the Education Committee with the activities of the department. In the Committee, he has taken charge of developing the subject of education of girls. The enthusiasm and ability which he has brought to bear on this important subject has raised it to the forefront of our programme and secured for it the careful consideration of all our members and of all other educationists in the State.

To Mr. Humza Hussain is due much of the development of the scheme of libraries and the special success of the Mysore Public Library. The Music School Scheme which has been sanctioned by Government and also the scheme for the improvement and development of *garadies* and *thalimkanas* also owe their origin to him.

Mrs. Rukminiamma's help has been valuable in considering the various aspects of problems connected with the development of women's education.

Professor Narayana Iyengar gave a note on University education and Mr. Shankaranarayana Rao paid attention to the subject of industrial training.

Mr. Venkatakrishnayya's vast experience and intimate knowledge of the past history of various educational problems of the State have been of very great use and constant help in our deliberations.

Dr. Srinivasa Rao prepared several lectures on sanitary subjects which were translated into Kannada for the use of itinerant lecturers. He also made valuable suggestions for enhancing the usefulness of our scheme of popular science lectures.

Mr. C. Krishna Rao studied the subjects of adult education and educational survey. He devised a comprehensive form to be used in conducting the survey which was accepted by the Committee and he also personally conducted the survey of a few schools. He also guided the compilation of a manual which summarizes the subjects discussed by the Education Committee since its inception, the reso-

lutions arrived at and the orders passed by Government on its recommendations. The want of such a manual was very much felt and but for Mr. Krishna Rao's valuable co-operation, it could not have been compiled so soon.

Mr. Basvayya presented before the Conference with admirable energy, single-mindedness and persistency his point of view on all important questions that came before the Committee.

Mr. Yegnanarayana Iyer studied the question of introducing a vocational element, agricultural or industrial into all stages of education.

On our indefatigable and learned Secretary Mr. Subrahmanya Iyer naturally fell the bulk of the rough and routine work of the Committee. He had frequently to do the task of putting our rough ideas into definite and presentable shape. He had frequently to clothe in flesh and blood the skeleton schemes that were hurriedly put together and flung at him. He had to work hard in sifting, examining, analyzing, and reconciling divergent views with the object of evolving useful schemes and achieving practical results. I have not the least fear of any contradiction from any quarter when I say that all members are deeply obliged to him for his unfailing courtesy and valuable help.

I have given only a very imperfect account of the work willingly and cheerfully done by the several members. But what I have said is sufficient to shew that every member took up for study and action some important subjects and did substantial work in connection with them. Our concern was one in which all the members took active part and there were no sleeping partners.

I must also take this opportunity of welcoming to the Committee for the ensuing year the new members who have been elected or appointed. I have not the least doubt that every one of them will take full advantage of the opportunity presented to him of working for the country's benefit in one of the noblest and highest fields of human activity.

Passing on now to the subjects discussed in the Conference I shall first take up the points

referred to by members in the course of their general observations on the report of the Education Committee.

Mr. Subbiah has suggested that English should be made a compulsory second language in all vernacular schools so that pupils who want to go up for higher courses may not be held back for a number of years for want of sufficient knowledge of English. This point will be noted for consideration by the Committee during the next year. He has also referred to the absence of boarding houses attached to mofussil schools. The subject has already engaged the attention of Government and the Education Committee at the instance of Government are developing a scheme which aims at making a satisfactory beginning in this direction within the limits of practical finance.

Mr. Venkatakrishnayya has drawn attention to the necessity of more schoolhouses for the depressed classes. He is no doubt aware that Government have recently sanctioned an arrangement under which the usual contribution required from villagers towards the cost of schoolhouses is waived in the case of schoolhouses for the depressed classes. As the department is provided with ample funds for the construction of schoolhouses and as local contributions are not to be insisted on, there is nothing to prevent the rapid growth of school buildings of suitable design for the depressed classes during the next year. He has also brought to the notice of Government the desirability of having more boarding schools of the type of the Mysore Panchama Boarding School for the depressed classes. One such school has been recently sanctioned by Government for Tumkur and will be brought into existence shortly and there is no doubt that more will follow as funds and facilities are forthcoming. The most striking remark of Mr. Venkatakrishnayya, if I heard and understood him right, was that in his opinion education could be made self-supporting. Nothing could give me greater delight if I could believe it. He is an advocate of free *primary* education; at the last session of the Representative Assembly in April and in this Conference also he spoke at

length in explaining the necessity of making *secondary* education free; and I remember very well that, at a Senate meeting held some time back, he strongly advocated that University education should be made free also. With every stage of education completely free to all, I do not clearly see by what magic power education can become self-supporting.

Mr. Ramanna's remarks are more refreshing and more enjoyable than even the mid-day lunch. I thank him not only for enlivening our proceedings with his quaint humour but also for the very appreciative and encouraging observations made by him regarding the work of the Education Committee. No one will be disposed to differ from him regarding the necessity of more food for the masses along with more education. His suggestion, that education should not make a boy or a man despise manual labour, will also be generally agreed to. Gradually by including agriculture and industries as subjects for the various examinations along with purely literary subjects, we are trying to infuse into our educational system the proper sense of the dignity of labour. There cannot also be much difference of opinion as regards Mr. Ramanna's observation that while encouraging backward classes, we should do nothing to set back the so-called forward classes. As he observed, while encouragement should be given to the backward classes to come forward, encouragement should also be given to the forward classes to become still more forward. The path of educational progress is an infinite one and no section or class can be regarded advanced as not to require any further progress.

Mr. Krishna Sastri's remarks regarding the necessity of a Science class in the Shimoga High School will no doubt receive consideration in proper quarters. As regards his complaint of want of science text-books in Kannada I may inform him that the Education Committee very fully dealt with the subject on the advice of a strong Sub-Committee and submitted recommendations to Government and that after considering them, Government have already appointed a Special Officer well-versed

in Science and also having a command of the Kannada tongue to remove this want in the matter of science text-books in the vernacular.

Rao Bahadur Mr. M. Shama Rao has taken full advantage of his relief from the responsibility of office to join the ranks of critics of Government and Government measures. While in office, perhaps, he was the most widely and severely criticised member of this Conference. He now emerges as a critic himself. But I may tell him that his criticisms are nothing like the majority of those which he used to receive but are entirely of a different order. His thoughtful remarks as regards the different purposes served by the Economic Conference and its Committees are full of cogent reasoning and reveal an intimate knowledge of the country and its conditions.

Mr. Rangaswami Iyengar has pointed out that there are some small communities who do not get even one scholarship under the Backward Scholarships Scheme if a strict numerical basis is adopted and he has suggested that one scholarship may be set apart in each area for each of these small communities. The matter has been referred to by the Education department to Government and is under consideration. The important point to see in this connection is that in trying to favour very small communities we should not allow the interests of the larger backward communities to suffer as it happens that some of the largest of backward communities are also most backward and therefore require all the help that we can give them.

Mr. Girimaji Rao is fast becoming in this house the noted champion of equal rights and votes for women. I earnestly hope that his proposal to make the education of girls compulsory throughout the State will become before long a universally accepted resolution of this Conference. As regards his request that the popular science lectures inaugurated this year should be delivered in the ensuing year in all district head-quarters, I may inform him that the scheme sanctioned by Government contemplates the delivery of those lectures not only in the district head-quarters but also in

the taluk head-quarters. In the first year considerable difficulty was encountered in getting the lectures written and printed. Now that a fairly large number of them on a variety of subjects have been written by the best available Kannada knowing scientific men in the State and the printing work has also made considerable progress, there will be no difficulty in arranging these lectures being delivered at district head-quarters and other important places.

Of the subjects separately discussed the most important was whether English or Vernacular should form the medium of instruction for girls in the High Schools and College classes. I am glad that the conclusions arrived at by the Education Committee on this subject after thorough deliberation has been confirmed by this Conference. It must be admitted, however, that this is a subject on which, considering both its theoretical and practical aspects, there is room for considerable difference of opinion as regards immediate practical action. The arguments on both sides were very fully and clearly set forth and the level of the discussion was indeed high. On one side it has been argued that under the present social customs of the country girls have very few years in which to complete their education and as it is desirable to impart as much real and useful knowledge as possible during this brief period, the attainment of a high standard in a difficult and foreign language should not be an essential part of the curriculum. It is argued by the advocates of higher education through the vernacular that English need not be eliminated but kept as a compulsory second language and it is claimed that education through vernacular involves less strain and is more natural. The advocates of continuing High School and Collegiate instruction through English argue on the other hand that in the present circumstances, instruction through the vernacular would certainly mean a lower standard of education, that as long as boys are educated through English it is desirable that girls also be so educated, and that as a high standard of English has to be kept up in any case as a compulsory subject,

there is no necessity to deprive our girls of the opportunity of acquiring knowledge first-hand from original works in English, education from translations being likely to be lifeless and unsatisfactory.

The vernacularists passionately ask how the English people would like their girls being given higher education through the medium of say, the Spanish language. The other side replies that if Spanish were the language of the ruling classes in England, if it were the language of higher culture and the link of communication between the different provinces under the Government of England, if it were the language of higher courts and of the higher stages of business and of political and public life and if all the boys and young men of England were receiving their High School and Collegiate education through the medium of the Spanish language, then it would certainly be natural and desirable to adopt the Spanish language as the medium of higher education for English girls.

It seems to me that in their enthusiasm to put forth their arguments as strongly as possible, both sides have on certain points gone beyond the range of actual facts. For example, Mr. Reddy said that Telugu and Bengali have produced text-books necessary for imparting the highest instruction in all branches through the medium of vernacular. I do not know anything about Telugu though I believe it cannot be more advanced than Bengali in this respect. But in respect of Bengali itself, I can state that it is not correct to say,—in fact, it is very far from correct,—that books in Mathematics, Physics and Chemistry and other sciences exist in the Bengali language through which the B.A., and M.A., Courses can be taught. The truth seems to be that considering the question in the abstract there can be no doubt that vernacular is more natural and convenient as the medium of higher education not only in the case of girls but also in the case of boys. But considering the practical aspects of the case, the arguments on the other side seem to possess considerable force and a careful and energetic preparation of some years

seems necessary before the idea can be carried out in practice. And it is certainly not desirable to carry out the idea in practice as long as there is the slightest chance of the standard being lowered by adopting the vernacular as the medium. The question is one of great difficulty and far-reaching importance and I may assure the Conference that Government will give their best consideration to the subject before arriving at a decision and that the well-considered opinion of a body like this Conference will be of great help to them in solving this difficult question.

Of the other subjects discussed the one relating to pedagogy being made an optional subject for the B.A. examination is one of great importance. Pedagogy is an optional subject for the Secondary School-Leaving Certificate examination and I understand that arrangements are being made to impart instruction in this subject in some of our High Schools. There should be some facilities for candidates taking up this subject to pursue their studies in the Entrance and B.A. classes and for this and other reasons the proposal deserves careful consideration. On the other hand, it has been argued that the adoption of pedagogy as one of the optional subjects for the B.A. examination would restrict the field of general knowledge of the graduates who take up pedagogy as one of the two optional subjects and the men while learning how to impart knowledge will not have sufficient knowledge to impart. According to this view pedagogy should be made a post-graduate course. I think there is room for combining both these ideas and while pedagogy can be made one of the optional subjects for the B.A. examination there should also be provision for those who want to take a fuller course and a higher degree after graduating in Arts.

Mrs. Rukminiamma has urged the necessity of introducing industrial subjects in schools and colleges of general instruction for girls. She has also said that literary subjects should be introduced into the schools and classes of Home Industries which at present impart instruction only in industries and handicrafts. With the

first part of her proposition there will be general agreement. As regards the second part it has to be remembered that the object of the home industries schools and classes is more economic than educational and the introduction of compulsory literary instruction may, it is feared, detract from the popularity of these institutions.

A very important resolution of the Conference is that which urges the introduction of universal education for girls at all taluk headquarters. Nothing illustrates better the value of a body like the Economic Conference than the rapid change in the current of public opinion on this important subject, *viz.*, universal education of girls. Most of the members are aware that when this question was first raised in the Education Committee sometime back there was great opposition. Last year, the proposal of the Committee to introduce the measure in the cities of Bangalore and Mysore was carried by a narrow majority. This year a proposal going much farther, namely, that of adopting universal education for girls at all taluk headquarters is passed by a large majority. If this change of opinion is due, as I undoubtedly think it is due, at least in some measure to the Economic Conference having set people thinking on educational and economic subjects, it may be claimed that the Conference is fulfilling one of its most important objects in a rapid and remarkable manner.

The programme of work of the Education Committee for the ensuing year has already been placed in the hands of members. The programme is a long and comprehensive one and we want to keep members and associates engaged in investigation on a variety of subjects of educational interest and importance. But at the same time we want to concentrate our energies on a few subjects and to attain practical results. In the first place we want to systematise, consolidate and develop the work of the Library Department. This department is one of the latest offsprings of the Education Committee. During the year under review, the foundations have been laid of a regular Library Department and an organizer of libraries of sufficient status

and experience has been appointed on the recommendation of this Committee. City Libraries, District and Taluk Libraries, Village Libraries and portable travelling libraries have been started in fairly large numbers during the last two years. In the ensuing year as I have already stated we want to consolidate the work and develop it still further. Another important subject to which the Committee will devote its attention in the ensuing year is the subject of inculcating business morals and business habits amongst the population by regular instruction in all grades of educational institutions. The introduction of the practical element, industrial or agricultural, in the system of Primary and Secondary Education will also form one of the subjects to be considered next year. The position of Science in Elementary and Secondary Education will also be considered and strengthened as far as possible. Physical education and physical culture regarding which a small beginning has been made on the recommendation of this Committee during the current year by the starting of the Boy Scout Movement on a satisfactory basis will also receive special attention. Last, but perhaps the most important, is the education of women and girls, remodelling the system and increasing the number of pupils in all stages being the most important items. This subject has received considerable attention during the current year and practical schemes will be formulated and action taken during the next few months. While attempting to remodel the education of women with special reference to their position and function in the family and society, we shall certainly not lower the educational standards for women by adopting a too narrow cookery-domestic-science ideal or the good-wife-wise-mother theory. We shall not forget Mrs. Rukminiamma's eloquent plea that higher education in its widest and broadest sense is as much the birthright of woman as of man and each is entitled to attain the highest standard and excellence in the branches or subjects which may be chosen.

From what I have stated it will be seen that the programme of the ensuing year is heavy

and full of subjects of great and far reaching importance. We shall require all the guidance of this Conference, all the help of our members, all the co-operation of our associates throughout the State and all the sympathy and support of the general public in our earnest endeavours to carry out our responsible work.

Sirdar M. Kantaraj Urs, B.A., C.S.I., Chairman of the Agricultural Committee said :—

The discussions have ranged over a fairly large number of subjects put forward by our Committee and have been characterised in the main by thought, study and above all practicability. Before dealing specially with the conclusions reached on the more important of them, I may perhaps make a few general observations on the tacit assumption underlying our deliberations, *viz.*, that the initiative in economic matters is a legitimate function of the State.

The last few years have been marked by a very notable change in the conception of the rôle of the State in the economic life of the people. The time-honoured principle of *laissez faire* has, after gradually losing its prestige, been finally hustled out of existence by the hard logic of facts. Of all the lessons which this cruel war has taught us, perhaps the clearest and most significant is the futility of mere individual effort and efficiency, and the need for organization in every department of life. The lesson was bitter, but was learnt with the earnestness of self-preservation, and every country is now intent on organizing its economic life on a State-basis, so as to secure the maximum of efficiency.

A striking result of the recognition of this essential function of the State has been the recent legislation which aims at securing the maximum agricultural production in the United Kingdom by putting all available land to the best possible use, securing this result if necessary even by the dispossession of occupiers who neglect this primary duty to their country. The Committee on whose recommendation this law was passed, and who dealt with a problem of over two centuries' standing, *viz.*, to make

the country less dependent on imported food, arrived at some conclusions which are not without significance to us. They found that even in the United Kingdom, where methods of cultivation are unquestionably far superior to ours, the food production could be enormously increased by better tillage and more farming, and that the increase in the production of cereals would *increase* and not diminish, the production of live-stock. Or in other words, that you could grow immensely more if you would, and that food for man also meant food for beast. I think that conclusion must give us pause in regard to the policy of reservation which we have been pursuing for sometime. It has always seemed to me that keeping areas of the best, arable land in a state of nature for purposes which would be far better attained by intensive cultivation, is a survival from a time when the demand for food was less urgent, and the land on which food could be grown less valuable, than now. The demand that this system should be discontinued has been getting more insistent in recent years and it is probable that the Departments will at no distant date have to cut down their reserves to the minimum possible of their requirements. If it is a truism that organization is the first condition of efficiency, it is one which cannot be too frequently urged or too constantly borne in mind. The need for organization in industrial development is self-evident but that it is equally necessary in agriculture does not seem to be so clearly recognised. Agriculture is deemed a domain untouched by the influences which have been shaping economic life, a sort of backwater unruffled by the strong current of evolution. This impression is not quite correct and the sooner we recognise the truth the better it will be for us. The days of the raiyat whose wish and care a few paternal acres bound and who is content to breathe his native air on his own homestead are numbered. The isolated raiyat, with his crude implements is as much an anachronism in agriculture, as a half clad Bhil with his bow and arrow would be in the present-day war, and I am afraid the chances

of the one are not one whit better than those of the other. The need for organization is a necessary result of the widening of markets, on the one hand, and of competition on the other—of what, in other words, is meant by the *industrialisation of agriculture*. The chief effects of this industrialisation are a need for intensive cultivation, and the use of better equipment and machinery. This means more capital, more knowledge and not the least more co-operation. I am glad that our discussions have touched on these requisites in no uncertain manner. The establishment of a Land Bank was discussed at some length and though the Conference were agreed about the necessity for the measure there seemed to be some haziness about its exact significance and its relation to the existing co-operative agencies. The Special Committee which dealt with the question and submitted the recommendations which were discussed consisted of business men competent to advise on the financial aspect of the question and officers of Government intimately acquainted with local conditions and in close touch with the agencies at work at present. All shades of opinion were represented and as the result of prolonged and careful consideration there was a general agreement that there should be a Land Bank with an organization working side by side but not necessarily in competition with the Co-operative Societies in the State; that the Land Bank organization should deal with long term credit leaving short term credit to Co-operative Societies, according to a clear line of demarcation; and that the funds of the Land Bank should be raised on State-secured debentures floated in the principal money markets in India. There was some difference of opinion as to whether the institution was to be on a joint-stock or a co-operative basis, and the majority were in favour of a joint-stock constitution. This is a proposal raising a number of important issues which require the most anxious and careful consideration; but we may say that the Conference's approval of the general scheme is in itself a considerable step forward.

There seemed to be some feeling that the establishment of a Land Bank would cut into the province of co-operation but I think this is a misapprehension. It will merely relieve co-operative organizations of uncongenial work, and leave them free to take more vigorous part in the economic life of the country. The scope of their usefulness in agriculture is practically unlimited and I do not think we have done more than touched the fringe of the subject. We have a fairly large number of *credit* societies and that is about all. The number of agricultural societies for purposes other than credit can be counted on one's fingers. We should have associations for all important operations connected with agriculture—for production, for purchase, for sales, associations of labour, associations of land-owners, associations for the employment of machinery and for the execution of irrigation works and installation of plants.

We have listened with great interest to Dr. Coleman's thoughtful and suggestive paper on the need for the consolidation of small and scattered holdings and have been struck by the disastrous wastefulness entailed by fragmentation as is now going on. As Dr. Coleman pointed out, a good part of the economic advantages of consolidation could be secured by co-operation and that is a fact which gentlemen who can influence the course of agricultural work in rural parts must bear in mind. I shall here mention one or two interesting examples of the application of the co-operative principle to agriculture.

In Italy, a law has been framed creating facilities for co-operative societies, specially labour societies, to take up domainial lands. It allows properties which may be privately let, to be leased on far more liberal terms than usual, to duly constituted agricultural producers' and labourers' co-operative societies.

This measure has been met half way in some places by co-operative organization of labour, which aim at leasing lands and cultivating them. The first experiments in this form of co-operation are said to have been very successful.

Another interesting experiment has been the creation of what are called collective *metayages*. Vast areas of land comprising all kinds and grades are given out for cultivation to co-operative societies of labourers who receive half the produce. It is said that this arrangement has worked so well that under it lands which primarily supported one family now support seven families of the metayer.

The consolidation of small and scattered holdings is a problem of very great national importance. We know that it has been resolutely faced and solved in Japan, Austria, and other countries; and with your co-operation there is no reason why we should not be equally successful in Mysore. It involves several important questions, legal, social and economic; for it is no good treating the symptoms without removing the cause. If we merely consolidated holdings tomorrow without removing the causes which led to their present broken and scattered condition, we would find that at the end of a dozen years, the old state of things had come back again. We should not only consolidate but also prevent re-fragmentation. Whether this should be done only by legislation or, whether as some economists tell us, the creation of a higher standard of comfort would secure the desired result remains to be determined. The subject will be specially investigated in a few selected villages and I trust that our members and co-operators will give us all the assistance they are capable of.

Coming next to agricultural implements, there is no doubt that the Agricultural Department has created a demand for improved implements but the supply is at present unfortunately both limited and unsatisfactory. I hope that the best technical talent, whether in the country or from abroad, will address itself to the solution of this problem which is so essential to agricultural improvement.

The necessity of organizing the supply of manure has been urged with the emphasis its importance deserves. This presents a great field for co-operative effort. Action is, as you know, being taken to establish a cyanamide factory but the best solution of the question is

the direction of concerted effort towards the conservation of our available manurial resources.

In regard to agricultural education, we have had some interesting discussions. Dr. Coleman told us that some difficulty is being felt for want of suitable blocks of land near rural schools for giving elementary education a practical bent. I trust that all interested in the country's agricultural development, will come forward with their co-operation in this important matter. You are no doubt aware that a vernacular course is going to be started at Hebbal and that the establishment of an Agricultural College is engaging attention. Private munificence, such as that which started the Chikkanahalli School, must be forthcoming in larger measure, and more than all things else, each of our workers must constitute himself into a centre of enlightenment to his less educated neighbours.

The improvement of live-stock has not failed to receive attention during the year and a number of important concessions have been sanctioned at the instance of the Committee. It is, however, necessary that local problems should be carefully studied and suitable action suggested. The whole question has to be studied comprehensively by an expert, and steps are being taken to get this done as early as possible; but in the meantime no effort should be spared to introduce obvious improvements.

GENTLEMEN, I cannot hope to touch on all the agricultural subjects which have engaged our thoughts; but I trust I have called attention to a few of the most important of them.

As our work develops our aims should grow in definiteness and our organization should be enlarged, strengthened, and adapted to our requirements. I trust that all of you will not only continue to work with the same enthusiasm which has characterised your work in the past but will communicate your ardour to others and thus enlist a daily growing corps of workers for the pre-eminence of Mysore as the model agricultural State of India.

Mr. P. Raghavendra Rao said:—

PRESIDENT AND GENTLEMEN.—Having been called upon to take up the Chairmanship of the Industries and Commerce Committee only

a few days ago and being unaccustomed to give an account of my stewardship of that Committee I rise to ask for your indulgence in not expecting a speech from me on this occasion. But I feel that I should say something very personal and express to you my full and heartfelt thanks for the way in which you congratulated me on Monday last on my appointment as a Member of the Council of His Highness the Maharaja's Government. It was very gratifying to hear the touching allusion to my father and for that also I beg to convey my grateful thanks.

PRESIDENT'S CLOSING SPEECH.

The following is a summary of the closing remarks of Sir M. Visvesvaraya, President-Dewan, at the Conference :—

GENTLEMEN,—After the able speeches of the Chairmen of the Central Committees, there is not much left for me to say. I could see that many members had come prepared to take part in the debates, some with written speeches. It is one of the disadvantages of my position as President, year after year, to discharge the disagreeable task of curtailing discussions. But, without some restrictions, you will admit, it would have been impossible to get through so much work. As we dealt with the subjects as they came up in a conversational manner we were able to touch upon most of the subjects of immediate interest and to pass in review nearly all the phases of our work.

I have to compliment the members on the high level of the discussions. These were appropriately led by our eminent citizen, Mr. Puttanna Chetty, who is doing important public work in so many directions. He gives generously of his time, money and experience for the public good and has set an example worthy of emulation by every citizen of the State. Dr. Coleman made a valuable and interesting contribution to the discussions by his paper on the consolidation of scattered holdings, and Mr. Reddy spoke with his usual eloquence. Mr. Venkatakrishnayya moved an important proposition and showed his many-sided earnestness in the cause of education. A notable feature of the session was the speech of Mrs. Ruk-

miniamma, which was characterised by much ability and sound judgment. Among other members, Mr. K. R. Srinivasa Iyengar, Mr. Humza Hussain and Mr. Subbiah made useful comments and suggestions. Mr. H. Subba Rao would have made an eloquent speech had time permitted and we must not forget Mr. Rammanna whose observations were marked by shrewd common sense and who always kept us in good humour.

One of the most important subjects discussed was the remodelling of women's education. A sudden change in the existing system seems undesirable, chiefly because there are no suitable text-books in the vernacular and no trained instructors. The education imparted in the vernacular under such conditions cannot be deemed efficient. One great drawback at present is the very small number of girls between the ages of 12 and 16, attending our secondary schools and colleges. We have been urging the college authorities to increase the number by every means in their power. As suggested by Mr. Narayana Iyengar, we ought to institute a large number of scholarships. In the case of very intelligent girls, we might even go so far as to grant scholarships to husbands and parents. The arrangements connected with technical and vocational education are still far from satisfactory. It is true we have an Engineering College and two Technical and some Commercial Schools, but in the lower standards the existing facilities are quite inadequate. In the coming year instruction in science, business and the use of machinery has to be given special attention. Greater prominence should also be given to University extension and publication work. The Popular Science Association lectures delivered during the year were, I understand, appreciated by the public. His Highness the Maharaja is very anxious that the education of the backward and depressed classes should be speeded up.

In regard to agriculture, we have listened to an able review by my colleague Mr. Kantaraj Urs. Increase of production should be one of our chief aims in the coming year. Luckily we have been having good seasons for the last few

years, but we cannot always count on them. We should prepare ourselves for bad ones by storing grain and multiplying occupations. Very early steps will have to be taken to increase the town population by marking out the extensions needed and creating industrial suburbs. As it is, our population is very unequally distributed between towns and villages, the former being extremely insufficient for the work of the country. We have not as yet succeeded in organizing a sufficient number of non-credit co-operative societies.

Some members have urged that the departments of Government should purchase only locally made articles. The suggestion has already received attention. Some of the large industries have not been begun on account of the difficulty of procuring the necessary machinery. I hope the Director of Industries will soon carry out his proposal to establish a rolling mill for the manufacture of bar iron. The forest industries are being investigated by a capable and conscientious officer and he ought to be able to show substantial results in time. The Geological Department has been instructed to give special attention to the practical work connected with the development of mineral industries. The Chamber of Commerce has not grown as rapidly as was expected and the brunt of the work has fallen on Mr. Rose and one or two other members.

GENTLEMEN, it gives me much pleasure to announce that within the past hour I have received a gracious message from His Highness the Maharaja, in which I am commanded to give you the assurance that the Economic Conference in some form or other will be made permanent. This announcement will, I know, be welcome to you, because it will give continuity to our efforts and stability to the organization. This does not mean, however, that the existing establishments will be made permanent by a stroke of the pen. Such questions will be considered separately on their own merits. The announcement merely amounts to a declaration that the Conference will be a distinct and permanent adjunct to the administration.

Before concluding, perhaps you will allow me

to say that whatever success has attended the efforts of the committees of Agriculture and Industries and Commerce is entirely due to the deep interest and wise guidance of my colleagues, Mr. Kantaraj Urs and Mr. Banerji. It has given me much pleasure to notice the cordial reception accorded by the members to my new colleague, Mr. Raghavendra Rao. Mr. Chakravarti's help in the matter of the development of education has been invaluable. Among other officers, Mr. Shama Rao's co-operation has materially advanced the cause of primary education in the State. Mr. Reddy is equally enthusiastic and we hope he may be able to show as good or better results during the coming year. The Rev. Mr. Thompson has been helpful to us on the Education Committee and Mr. Barton on the Industries and Commerce Committee.

A great deal of the work of the organization has fallen on Mr. D'Souza, the energetic Secretary of the Conference. Mr. Rama Rao and Mr. Subramanya Iyer have also been doing useful work in their respective spheres. We welcome the latest addition of Mr. Balaraj Urs to the staff of the Conference, where I have no doubt he will make his mark.

The work of the Conference has always been of an onerous character and we could not have made the progress we have without active encouragement in many ways from His Highness the Maharaja. The Conference owes its origin to His Highness's great love for his subjects, his devotion to their interests and his constant desire for the betterment of their condition. In the darkest hours of our work His Highness has cheered his officers with his unfailing sympathy and support. His Highness's decision that the Conference should be made permanent in some form is a fitting act of grace on the part of a far-seeing and benign ruler.

Mr. A. Rammanna, Advocate, next proposed three cheers to His Highness the Maharaja of Mysore, which was lustily responded to.

With this the Ninth Session of the Mysore Economic Conference came to a close.

MYSORE ECONOMIC CONFERENCE

NINTH SESSION. 1918.

Press Opinions.

The Express. (Bankipore)—Mysore is one of the few Indian States which have made rapid progress in recent years and started various movements for social, political, educational and economic amelioration of their subjects. The annual Economic Conference is one of the most prominent institutions in Mysore and it is doing practical work in the matter of revival of old and introduction of new useful industries. The last Conference was held only the other day and Sir M. Visvesvaraya, the worthy Dewan of the State, presided over its deliberations. The Reports of the Industrial, Commercial, and Agricultural Committees submitted before the Conference testified to a brilliant record of activities of which any Indian State might well take credit.

The Malabar Herald. (Cochin)—The Mysore Dewan's Speech at the last Mysore Economic Conference is an important pronouncement. It embodies an ambitious scheme. Ambitious it must be. Behind it lies the ambition of the Ruler and the Dewan to promote the people's welfare. This is the spirit which ought to prevail in every other Native State. It is, therefore, we present Mysore as a model State. Need we say that it ought to be followed by those who care for the people's welfare. An Engineer Dewan that he is, he is engineering the State's affairs with remarkable success. This will be seen from the summary of the progress disclosed by the speech.

The Hindu. (Madras)—The labours of this organization, the objects of which are well-known, in seeking to promote the economic well-being of the people, enrich and ennoble rural life and revive old and introduce new useful industries have had a degree of success on which the principal author of a novel experiment

may well be congratulated. There have been criticisms of the Conference, destructive and constructive and one often hears of complaints of the outcome not being commensurate with the expenditure of money and labour. Its many sidedness, the incessant incentive to endeavour required, the constant pressure from above necessary in the comparatively ignorant condition of the population and the immensity of the task above all, may well make people hesitate to embark on such a comprehensive movement; but having once been started on its way, it has progressed day by day, and whatever its actual achievements may be, there can be little doubt of the spirit of divine discontent which it has created, of the fresh energy which it has infused into all classes of people and the valuable habits of thinking and working which it has developed. The Reports of the activities of the Conference indicate that a stage has been reached when external stimuli may not be required at least to the same extent as has been necessary till now, in order to ensure the continuance of the work of the Conference and induce the people to exert themselves. A glance at the record of the work of the Conference since its inception will convey an idea of the practical benefits which have accrued from the efforts of the Conference.

The Daily Post. (Bangalore)—Well, Sir Visvesvaraya may be something of an idealist, but his is a healthy and well balanced idealism. It is a much abused word, and even so deep a thinker and admirable a gentleman as Mr. A. J. Balfour was somewhat hard upon it when he said that "our ideals are framed, not according to the measure of our performances, but according to the measure of our thoughts." It is well to set up ideals, so long as they are not utterly unattainable. Even if they err slightly on the side of extravagance, that is infinitely preferable to their entire absence of ideals which spells stagnation. But, although the Dewan's picture of what Mysore should do and he may be ambitious, it is in no sense visionary.

The Indian Patriot. (Madras)—It has been proved beyond doubt the labours of this organization have been very useful, and the keen interest evinced in the success of this organization by the authorities has been largely responsible for its growth.

The Madras Mail. (Madras)—At the last session of the Mysore Economic Conference, the discussions and the representations to which they referred were, many of them, of a interesting order and quite outside the beaten track upon which debates of this character usually proceed.

The United India and Native States. (Madras)—The Conference has passed the stage of experiment and its success has even surpassed expectations. Under these circumstances the decision is one which will tend to promote the material prosperity of the people. In this connection it is impossible not to admire the foresight, sagacity and statesmanship of the Maharaja which alone has rendered possible the inception and the continued existence and success of the Conference and the portion of Sir M. Visvesvaraya's speech dealing with His Highness' share of responsibility for the results achieved so far is well worth reproduction:—

"The Conference owes its origin to His Highness' great love for his subjects, his devotion to their interests and his constant desire for the betterment of their condition. In the darkest hours of our work His Highness has cheered his officers with his unfailing sympathy and support. His Highness' decision that the Conference should be made permanent in some form is a fitting act of grace on the part of a far seeing and benign Ruler."

The Indian Patriot.—The Mysore Economic Conference is the production of Sir M. Visvesvaraya. In our opinion it is the most important of all Mysore Conferences, the power house, if we may call it so, of all ideas that have made Mysore what it is in so short a time.

Every Indian State can well place before itself the ideals which Sir M. Visvesvaraya has discovered for Mysore. We admit that large

sums of money are required to undertake the schemes which, for instance, Mysore has undertaken, but they can on a small scale and, perhaps, with a greater hope of success.

The Servant of India. (Poona)—The opening address of the Dewan is able, lucid, and inspiring. It breathes a spirit of genuine earnestness and gives an unmistakable indication of the fact that the Mysore State is bent upon utilising all its energies in the direction of ameliorating the economic condition of its people. The proceedings of the Conference, will be read, we are quite confident, with immense profit by the officials in British India whose efforts for the development of its resources have so far been very spasmodic and half-hearted.

The Mysore Patriot. (Mysore)—Special thanks are due to His Highness the Maharaja and his Government who, in the midst of numerous discouraging circumstances, have been able to make the activities of the Conference bear excellent fruit in so short a time as seven years.

The New India (Madras)—The Mysore Economic Conference, on the other hand, was started with the noble idea of improving the condition, moral and material, of the people of the State, and one can safely say that the object is being steadily realised. The master mind which brought it into existence, Sir M. Visvesvaraya the Dewan Saheb, has fostered it with great care, and its results must have surpassed all his expectations. The annual function is, in a sense, a large Educative Assembly, at which practical means of improving the lot of the people, in all its aspects, are keenly discussed and the programme of work for the following year laid down.

This year's Session of the Mysore Economic Conference which was opened by the Dewan Saheb on Monday last was unique in many respects. It shows, how, if only there is the will to work sincerely, difficulties created by the war or any other calamity need not deter us in any of our work. The work of the last year is a splendid record of strenuous effort in all departments of activity.

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THE REVOLUTION IN EDUCATION—REFORMS IN THE PRIMARY SCHOOL.

BY PROF. J. A. GREEN,

Professor of Education, University of Sheffield.

ALTHOUGH most people who have an intimate knowledge of our elementary schools would agree that the address of Principal Griffiths at the meeting of the British Association was unduly pessimistic, it remains true that there is in many quarters a feeling of dissatisfaction and disappointment, something almost in the nature of disillusion, in regard to the actual achievements of the schools. In point of fact this is all to the good. Satisfaction in so vital a matter as education would mean, at best, standing still, or, at worst, serious backsliding. Even harsh criticism is better than none at all.

LONDON'S LEAD.

There is perhaps a danger of thinking only of legislation and administration when we talk of education reform. Effective reform can only be accomplished in the schools, and the first business of the legislator and administrator is to clear away obstacles, and provide the necessary machinery for good work. Of present obstacles, none is greater than that of large classes and small rooms. So long as a teacher is asked to take charge of sixty children in a room

which allows only ten square feet per child for moving space, it is difficult to introduce into the work the spirit of freedom and of individual consideration which is essential to good education. In such circumstances the old sitting-still routine must reign supreme, and that alone is sufficient to account for many of our present failures.

Of course the responsibility does not rest entirely with the Board of Education, which only says that a teacher shall not teach *more* than sixty and the school shall provide not *less* than so many square feet per unit of accommodation. Some local authorities are recognising that these are extremes and not ideal figures. Some of them are entering upon gigantic schemes of reconstruction in order to bring their schools more into line with modern ideas. London, for example, proposes to spend £5,000,000 in reducing all classes to forty, leaving them in rooms originally planned for sixty—a vast scheme which will take fifteen years to complete.

Money is the great difficulty which changes of this kind are up against, and we are all expecting much more liberal disbursements from the Treasury in furtherance of what is, after all, a national obligation. Perhaps less wealthy or less well disposed authorities will then follow London's admirable lead.

THE HUMAN FACTOR.

But such schemes may break down in spite of their inherent excellence. We are already on the point of being short of teachers. The number of Training Colleges has

been enormously increased—in 1903 there was accommodation for 6,612 students in these institutions, in 1913, there were nearly twelve thousand places available—but at the same time the supply of human material to fill them seems to have been stopped, for, whereas in 1906-7 there were 11,901 pupil teachers in England and Wales, at present there are probably less than half that number who are passing through probationary years. On the basis of our present needs these figures are disturbing, and a little simple arithmetic will bring out the nature of the difficulty if trained teachers are to be provided for forty children instead of for sixty.

Some way of escape from this dilemma must be found. We cannot, of course, compel suitable boys and girls to become teachers. The service can only be provided for by making it more attractive. Two steps might be taken in this direction. In the first place, a decent competency should be assured to every efficient teacher. Only a fraction of them can ever hope to become head-masters, but the possibility of marriage in at least modest comfort should be within reasonably early reach of all. In the second place, the number of prizes open to the profession should be considerably increased, and some scheme should be devised whereby able and zealous young men might secure promotion. Nothing is more discouraging to the enterprising beginner than the feeling that whatever he does, he must continue to work in the junior ranks for twenty years or more until his turn comes for a head-mastership. The difficulty lies in the method of selection, which should satisfy not only the public but the profession itself. Perhaps a higher professional diploma in connection with the Universities might be instituted which would encourage the abler class-teachers to study the larger aspects of their work—its social and economic bearings for example. The head-master of the future should be an expert teacher and something

more, and it is of the first importance that heads of schools should get their charge before they have lost elasticity of mind. The cost of any sensible improvement in the position and prospects of teachers will not be trifling, but of all ways of spending money upon education, none is likely to be more profitable to the State than this. Real progress rests with the teachers. It is the human factor which will count for most in the long run.

A SELF-CONTAINED SCHOOL.

Still, wise administration may help enormously. In this respect perhaps the greatest need is in the direction of greater decentralisation. Every school presents a problem of its own, but the natural tendency of a local authority is to think of its schools as so many similar units. The machine is easier to work on that basis. New subjects can be introduced cheaply by grouping schools and establishing special centres of instruction. In this way woodwork, cookery, laundry, etc., have been provided for. A circular instructs head-masters to send a certain number of pupils to the centre on such and such a day every week. Nothing could be easier from the "office" standpoint. But we are growing out of the idea that education means the mere addition of a number of disconnected subjects forming what we call a curriculum. This is educational patchwork. Schools should be self-contained, and all the work there should be under the control of the head-master, who will adapt his machinery to the needs of the children as he knows them. There are girls in the primary schools who get a good domestic training at home. The "office" knows nothing of this. If a boy is doing practical work in the school workshop, its aim and its nature should be determined by the man who knows him altogether and not by some person who draws up plans for boys in the abstract.

A self-contained school and a head-master who has a very large measure of freedom is

the ideal. Freedom and real responsibility always bring the best out of a man. Under these circumstances, schools will do what is expected of them. Part of the work could and should be tested. At present we probably suffer from the absence of such a test, and reformers hesitate to urge the necessity because of its possible abuse. But ought we not to be reasonably sure that boys and girls who leave school are able to read, write, and make arithmetical calculations at least accurately enough for life's ordinary needs?

THE TIME TABLE.

Of course this is not all a school should do, but the higher work, if one may call it so, can hardly be tested in the same way. For it, we should trust the school-master, and leave him free to work out his own schemes. Given men and women of wide training, they will avoid the error of thinking out their problems in terms of their own career. It is practical initiative and purposefulness rather than academic reflection that counts in the ordinary man's life, and these qualities have at present very little school value.

The school-master himself is tied up in a routine system which is represented by the time table—an extremely elaborate document, in which the day is parcelled out into periods varying in length from ten to forty-five minutes; herein is laid down what the teachers and the pupils must do during each of those times. The time table has been considered and approved by a superior officer, and no departure from it may pass without a written record. Every teacher knows how irksome a fetter such a time table often is, yet should he offer a really elastic scheme of work, he will probably get it back with a request for greater precision. He is asked to say there and then what every class shall do every Tuesday morning all the year through at 11.15—reading shall we say. Often enough on any particular Tuesday it may be the least profitable thing

for them to do, but it is on the time table and it is done, for habit is stronger than the constitutional freedom which the teacher enjoys. The result is a habit of piecemeal working formed in the boys, and the idea that when the clock strikes they must stop work whether the job is finished or not is bred in them from their infancy. Visit a classroom, ask the teacher or the boys what they are doing, and why they are doing it—you will in ninety-nine cases out of a hundred be told "Time table." "Journey work" of this kind is not education. Plans of operation of course there must be but we are coming to see that these do not make routine the last word in school organization.

EDUCATION AND LIFE.

This brings us to the most fundamental of all the reforms which are essential in our elementary schools. Englishmen have always shown a distrust of education. That distrust could of course only be of education as they knew it, and now we are beginning to understand the distrust better and to see that it is perhaps not so irrational after all. The traditional type of school has very little to do with the realities of life, and we are learning from the biologist that this is fundamentally wrong. The separation of school and life must cease. We see the new spirit endeavouring to express itself, rather crudely perhaps, in the demand for trade-schools, and in the growing interest in vocational schools. Broadly viewed, this new educational motive is to be welcomed, though we must take care that it does not degenerate into a shallow utilitarianism. Its importance lies in the fact that it expresses the need for an atmosphere of reality in the whole of our educational system, and it calls attention thereby to the gravest defect in the primary schools of the country, a defect which is none the less real because it is not easy to make clear to the mind of the layman.

Even thoughtful parents are inclined as a

rule to accept the tradition in which they were themselves brought up, and to measure a school's success by the rapidity with which the pupils overcome the mechanical difficulties of the three R's. They do not realise that, when children come from homes where these accomplishments are put to little or no use beyond that of reading the sporting columns of the evening papers, they rapidly degenerate when the drill of school ceases. What is true of reading and writing is also true of much else that is taught. It misses fire somehow or other, and we have to face the problem of whether this is a necessary evil or whether it is only incidental to the particular way in which the school does its work. In taking the latter view, reformers are not of course attacking either schoolmasters or administrators. They are perhaps a little in advance of the time, but their view is already making itself felt in various quarters.

THE SCHOOL OF THE FUTURE.

To go to the root of the matter, school organization has grown out of the idea that childhood was a time of preparation and of discipline simply. School authorities at present think of what will be useful to these children when they are older rather than what will make their lives now, as *children*, richer and fuller of meaning. But this view is the view of the future, and the reformer sees in it a cure for many present-day shortcomings. Schools should teach to live and the best way of learning to live is by living. But life does not mean life under constant direction. A slave is not living in the human sense of that word, and children in school are, from the standpoint of mind, in a condition not unlike that of the slave. They do as they are told, because they are told. It is not in this way they will learn to be free. Is not the most striking criticism of the present position to be found in the emphasis laid upon organized games? Here we are told character is developed! Classroom life needs the remedial

atmosphere of games! Is this not wholly wrong? Games are important enough, but surely they should play a subordinate part even in school, instead of being, as they often are now, the only "reality" there, from the standpoint of the pupils.

It would take too long to describe even in outline the outcome of all this. The school of the future will be a very different place from that we know now. Instead of pupils reading books as an academic exercise, they will go to them as we do, sometimes for recreation, sometimes for practical information, sometimes in pursuit of an intellectual interest; instead of writing "compositions" so arid and formal that no boredom can be greater than that which reading them induces (except perhaps the boredom of writing them), they will write when some clear gain demands it. The central feature of the school will be "doing"—many classrooms will be more like workshops than the prison-houses we know now, and the so-called "subjects" of the curriculum will get their meaning in relation to these central activities.

Unfortunately reform cannot be so rapid as we might wish. Costly buildings, dear to members of education committees are often fetters to progress. In future, it is hoped that authorities will remember that education is not fixed either in its form or in its methods, and that the best type of building is one that, whilst it completely serves our present needs, can be easily adapted to new ones as they arise, or that can be scrapped like an out-of-date cruiser when it no longer meets the requirements of the time.

To return, however, to the supreme point, it is the personnel of the teaching profession that is the key of real educational reform, and the nation should concentrate its effort upon the problem of providing and training men and women equal to the responsibilities which a school-command should put upon them.

BRITISH RAILWAYS AND OTHERS: A COMPARISON.

BY LORD MONKSWELL.

ROUGHLY about the year 1830 it was recognised that railways offered facilities for land transport so greatly superior to those offered by any other system in speed and convenience that the adoption of railways was for all civilised countries a matter of urgency. Before railways existed land transport was so difficult and so slow that any serious failure of the harvest in any district was generally followed by famine, even in the countries of Western Europe.

Within a few years, therefore, the construction of railways, often on a large scale, was begun in most civilised countries, but from the very beginning there were naturally great differences even between different railways in the same country on account of the natural features of the respective districts traversed, the density of the population, and the ideas of the different constructors, while between the railways of different countries yet further variations came into existence due to such causes as the degree of centralisation of Government, commercial policy, and the favour or otherwise with which railways were received.

The general conditions affecting railway construction and development in some of the principal countries may be thus summarized. Germany, owing to the multitude of sovereign States, which in many cases wishes to restrict communication with their neighbours, became originally covered with a number of badly planned local lines. After the union of Germany, resulting from the great war with France, a policy of railway centralisation was step by step put into force, first by the gradual purchase by the Prussian State of the Prussian lines, and then by the gradual extension of the Prussian system

(which now includes railways in Hasse and other States), and by working agreements with a number of other administrations. Much attention has been paid to making the railways as valuable as possible strategically.

The railways, too, being in the hands of the State, the Prussian Government is able very accurately to graduate the rates charged so as to encourage any branch of trade which it particularly desires to develop, and this is habitually done.

Most of North Germany being exceptionally flat, there were few natural difficulties to hinder the construction of railways, which has therefore, on the whole, been done fairly cheaply.

The Government of France was highly centralised, and local railways planned without regard to the requirements of the country as a whole were not allowed to come into existence. Very little railway construction took place before 1842, in which year a very neat scheme of lines embracing the whole country was arranged. The general idea was to take Paris as the centre and divide the country into districts of considerable size, each district to be served by a single railway, whose principal line or lines were sufficiently remote from those of its neighbours to make competition for traffic between the same points impossible. Each district was handed over to a separate company, which was to retain the concession for ninety-nine years, at the end of which time the shareholders were to have been gradually bought out by means of a sinking fund, and the railway was to become the property of the State. The State has provided heavy subsidies in various forms. The greater part of France is still served by companies, but in 1878 the State bought up a number of lines in the West, and thirty years later bought out the company working the *Chemin de fer de l'Ouest*, with the result that almost the whole of the lines in the North-West corner of France, are now in its hands. In both cases the lines taken over

ran generally through poor districts and were badly equipped, so there was practically no chance of their paying well. At the present time the annual loss to the State on account of what used to be the *Chemin de fer de l'Ouest* is very heavy.

The United States owe the greater part of their development to their railways. Even in the more thickly populated East the necessity for a very large amount of railway has been so acutely felt that a great deal has been constructed in a rough and hasty manner, while to such an extent are the more remote parts of the country dependent upon the railways that I believe there is to this day nothing approaching a tolerable road across the United States. The trans-continental lines, at least, have received heavy subsidies, particularly in the form of land in the districts which they have opened up. The carrying on of railways business is much complicated by the fact that this has to be done in accordance with the often very diverse laws of the different States which each railway traverses. Railways are, generally speaking, rather more unpopular in the United States than is usual elsewhere, and laws hostile to the railways have been frequently passed in many States of the Union. Considering the immense debt which the country owes to the railways, this is at first sight rather odd, but it is probably natural enough in reality, as corporations on which so much depends are often not specially beloved by people who are constantly being impressed with a sense of their power. Serious, and often probably just, complaints, moreover, of the financial methods of railways in the United States have frequently been made.

Coming now to British conditions, it is found that the first cost to the companies was for a variety of reasons very high. British railways (except Irish, and to an insignificant extent, Scottish, railways) have in the first place received no financial assistance from the State; they were generally

received with bitter hostility by the land-owners, so that the legal expenses which had to be met before they could be begun were very heavy; a great deal of the land they wanted would have been very expensive any how, owing to the comparatively high state of development of British land at the time of the introduction of railways, and it was made much more expensive still because of the unwillingness of the owners to sell. British railways, being the first to be constructed on a large scale, had to do a great deal of pioneer work; and, on the whole, the lines were constructed in an unusually solid and expensive manner. These lines were not planned as a complete whole, but were allowed to come into existence in a haphazard manner, and there was a strong but exceedingly vague idea that it was a good thing to encourage more than one line to be built between the same points. It was apparently thought that this would stimulate competition, and public benefit would result. It is, of course, obvious that a country of a shape so irregular as Great Britain could not have been divided up into separate districts in nearly so satisfactory a manner as was done in France. It would, for instance, have been almost impossible to avoid the construction of something very similar to the existing East Coast and West Coast routes from London to Scotland. Still, the greater density of traffic in many parts of Great Britain has provided a good deal of work for all the lines that were built. Though the rivalry of lines serving the same places has occasionally provoked outbursts of spasmodic competition, there is some reason to fear that the real result of the existence of all these interlacing lines has been to make the companies do everything in their power to avoid competing with their neighbours, and has even acted as a powerful deterrent to the introduction of any improvement that might possibly stir up another company to go one better.

It is, however, perhaps due to competition

between rival lines, that the general goods traffic is carried on with a speed and elaborateness which are not the rule in other countries. The goods carried by British railways are generally despatched in quite small consignments by trains travelling at comparatively high speeds, and almost all the carting, checking, loading, unloading, etc., are performed by the railway. In these circumstances the rates charged in Great Britain are naturally much higher than in countries where the railways do much less of the work under far less onerous conditions. In the United States, for instance, the railways do nothing but slowly haul the wagons, which have been loaded by the consignors at the starting-point, to their destination, where they are simply handed over to the consignees untouched. Any traffic which is not dealt with in this way is undertaken by one of the express companies, whose charges are extremely high. Owing to the recent formation in Great Britain of alliances between groups of railway companies the effects of the excessive interlacing of the railway lines have been to some extent removed, and it is quite possible that the companies, being obliged to devote less of their energies to considering each other, will be in a position to devote more of their energies to serving the public. If the further step were taken of placing all British lines under the management of the State none of the management's energy would be dissipated by having to think of rivals, but very serious political dangers would arise from the enormous pressure which the railway servants, if highly organized and directly employed by the Government, could exert in order to secure concessions for themselves. It is by no means impossible that the representatives of a body of men having so immense a number of votes at their disposal as the railwaymen have might find themselves in a position to dictate their terms to the House of Commons. If it is objected that nothing of this sort happens in connection with the

State railways of Prussia it is easy to show that this military State has taken adequate precautions to prevent anything of the kind from happening.

With regard to technical differences between British lines and those of foreign countries a difference is found in the gauge of the rails in Russia, Spain, India, South America, etc., (and Ireland). The British gauge of 4 feet 8½ inches is, however, by far the most widely used. It stretches across Europe from Calais to Constantinople, it covers the whole of North America, is found in Egypt and in China, and will probably soon reach the Persian Gulf. Owing to the fact that Great Britain was the first country to introduce railways the tunnels were unfortunately made smaller than they might have been, so that British rolling stock is lower and narrower than that of the railways of other European countries, while in America there is still more head-room than on the Continent of Europe. On the other hand, the small size of British engines is to some extent set off by the excellence of British coal, which enables a great amount of heat to be generated in a small firebox.

A machine has been invented capable of manufacturing paper milk bottles at the rate of 5,000 per hour. It is 90 feet long, and costs over £3,000. Wood-pulp is the raw material employed. The process does not require high-priced paper pulp; any fibrous wood is said to work equally well. One ton of pulp will produce 60,000 bottles. Owing to the low cost of manufacture the paper bottles are said to be cheaper in the long run than the glass bottles now in use. Only three men are required to work the machine, and from beginning to end the milk bottle is handled only by steel fingers, and it is claimed that the apparatus meets all sanitary requirements.

NEED FOR IMPROVED FACTORY ORGANIZATION.

BY THE RT. HON. J. M. ROBERTSON, M. P.

"SCIENCE," is by common consent held to apply, in industry, to the cultivation and application of the higher forms of physical knowledge of all kinds. But the spirit of science, which is simply concern for exact knowledge of causation, enters in some degree into all careful action; and there is assuredly great room for its wider activity in the management of business in general. What the commercial experts call "system" is just the method of science brought to bear in business affairs. And in thousands of businesses "system" is still very imperfectly developed.

To artistic minds, perhaps, the notion may be on some sides repellant. The principle, for instance, that in manufacture there should be no superfluous movement, that the ideal is just to make so many movements as will do the required work and no more, is apt to seem soulless. The artistic soul for which its labour is one of love, would linger over some of its tasks, seeking whether or not there may be room for an added touch. But there is really no fundamental difference between art economy and trade economy in view of results. The artist is not so ready as the toiler to "down tools," because his task is for him something more than doing of efficient work to earn his bread. But even the artist wastes no time, if he can help it, in mixing his colours; and he finds ground for some of his highest praise in "economy of effect" in line and composition in his own field. The artist who makes one sure stroke do what others do by many strokes is acknowledged to be not less but more an artist in doing so.

Of the thousand ways in which force, and

therefore capital and labour, can be economized I propose to speak here of one—coordination of work in factories. In the work of the Trade Boards, which in the recent years of peace were quietly doing so much to improve the conditions of labour in low-waged industries, it was again and again found that "sweating wages" were in many individual cases not the sign of the employer's desire to grind the faces of his workers, but the mark of his real difficulty in making profit enough to enable him to pay more. A good illustration is the industry broadly describable as that of "slop" tailoring—a technical term which for popular purposes I shall use in a looser descriptive sense than the strictly correct one. In that industry it was found that while some large businesses paid wages which practically put them outside of any category of sweating, others paid very low wages indeed. And the employers in the latter cases frequently protested that their business could not afford more. They produced their goods under competitive conditions; if they were undersold they lost their trade; and to pay higher wages meant to cut away all profit.

In some cases, perhaps, the only remedy was to compel a rise of wages all round, involving a rise of price. But a number of employers, on investigation, found that there were ways of cheapening production which not only involved no sweating, but made possible at once the payment of better wages. The machinery of the Trade Boards brought together a number of employers who had previously known each other only as rivals. Coming together, rather distrustfully at first, they began to compare notes as the business methods, and gradually a number who had supposed themselves unable to spare more for labour discovered that at some important point or points they were behind their more successful competitors in business methods. Naturally it would be in the smaller businesses that such

discoveries were most frequently made. Factories in general grow great by being well managed. But even in the larger factories, employers at times learned that they were overlooking leakages of time and labour which seriously impaired their total efficiency. Waste of time in the distribution of material and the allotment of tasks will arise in any factory where there is not as vigilant a watch over such details as there is over the financial department.

It has often occurred to me that employers might gain greatly by openly consulting with their workers as to matters of organization. In multitudes of cases they gain by the inventions of employees; and the more judicious and enterprising have long been wont to encourage invention. But they might equally gain by taking hints from their workers as to organization in general. Such hints actually do pass from workers to labour organizers, who sometimes pass them on to employers with beneficial results. But the price of perfect organization, like the price of liberty, is eternal vigilance; and there should be a constant openness to new discovery in these matters. When it is realized that organization means profit, and that better organization thus means not only increase in wage-paying power but the possible continuance of employment where otherwise it might be arrested, there is seen to be a new reason for habitual consultation between employers and employed.

In the cases of which I have spoken, gain has come from conference among employers who previously had not conferred; there we have one of the evidences of the importance of trade societies in general. Too often, doubtless, business men are reluctant to give information which will help their competitors; but in this as in many other directions the standard of public spirit is steadily rising. War at least reveals that there is a community of national interest which involves every kind of national efficiency. Weak

industries are national weaknesses. A few which cannot be made really strong had better just be abandoned; but it is one of the standing lessons of trade experience that the difference between weakness and strength may just be bad organization.

The captain of industry in short, must see to it that he not only makes the utmost use of "science" in all his mechanical processes but he himself is scientific in all the departments of his concern. To put it bluntly, he will have to work harder in future. In no country have business men had a larger share of leisure in modern times than in Britain—at least in none of the leading industrial countries where business is carried on a great scale. Much of this comparative lack of stress was certainly due to the Free Trade conditions of a long past. But the best of fiscal systems cannot in future avert the need for a great increase of productive power in this country. By no other means can it pay off its debts.

To a certain extent the required increase will undoubtedly have to be secured by combinations. The large factory has, up to a certain point, inalienable advantages over the small; and in some industries—the chemical, for instance—the gain from combining a large number of modes of production is overwhelming. This has been abundantly evident in Germany. But combination is not the last word, or the only word, in the extension of production. There is a point at which a giant factory runs multiplying riots of inefficiency, just because the perfect co-ordination of everything calls for more and more stress of attention. I have known a large factory driven to abolish one of its departments and rely on outside work where before it had supplied itself. It is significant that in the past evolution of animal life the giant organisms have mostly died out; and the elephant, in its turn, seems likely to disappear. I do not press the analogy which could easily mislead us if we followed it confidently; but it is suggestive.

The measure of fitness, in any case, is the same all round—success. If a British industry is found to lag in competition with a foreign one, the sane course is not to begin to call for tariffs but to ask first whether it is not behind in point of organization. I could name some which have notoriously been hampered by long-protracted failure of co-operation between employers and employed. And wherever an industry is found to be paying unduly low wages, defective organization is one of the causes first to be looked for. If employers all round will more and more exchange ideas for the general good, and further try to elicit the ideas of their 'hands', a great and helpful impulse may be given.

One hopes for much, in this way, from the new commercial journalism, which cheerfully presumes to teach business men their business. In the United States, for years past, there have been professional advisers of business concerns, who undertake to tell a lagging firm, after close inspection, where it is lacking in point of management. It is to be feared that British firms will in general be less ready than American to resort to such guidance. Fear of disclosure will operate, as well as unwillingness to believe that any man can be competent to advise as to the management of business of every kind. One fear I believe to be ill-founded; though there are experts and experts, in this as in other walks of life. Given honesty—and as to this business men can consult with each other—the experienced man with an eye for organization may be quite as useful as the sanitary inspector—who is not infallible either.

Pending the development of the organizing expert, however, much benefit might be had from a spirit of mutual help among the heads of businesses themselves. And perhaps the war may have some effect in promoting fraternity of that kind though it is not a price that any of us would have proposed to pay.

INDUSTRIAL RESEARCH IN THE MYSORE STATE.

BY S. G. SASTRY, M. SC., F. C. S., ETC.

WE cannot face the industrial future of the Mysore State equipped only with good intentions and ideas of last century. There must be a change, but no change is possible without a thorough understanding of the needs of the present day scientific requirements which are essential for the success of the industries of the State. Nine years have elapsed since the inception of the Economic Conference, and the Conference has justified its existence by its many-sided activities and it has proved its usefulness in that practically the whole body of the Conference voted for its being placed on a permanent footing as a separate department of the State. The policy of the department is to encourage suitable industries in the State and whenever required to give a helping hand to the manufacturer, either in the form of grants of money, loans, or supplying technical information. This technical information can only be obtained by constant research by expert scientific men.

Success in research depends on a large body of willing and highly skilled workers and also on the facilities given to them to carry on the investigation. Scientific research demands prolonged and arduous labour and the men who tackle the important problems should be industrious and patient. The undertaking is costly and requires financial support from the Government. The time has arrived for the Government of His Highness the Maharaja of Mysore to provide for industrial research in the State.

About the year 1900, the Government of Great Britain and Ireland took the important step of enquiring into the problem of giving State help and encouragement for organized industrial research so as to benefit the trades and industries of England. The enquiry led to the establishment of the National

Physical Laboratory in 1902 with a grant from the State treasury. About the same time, the Imperial Institute began to undertake researches in relation to industries.

It was not, however, until the war broke out that the serious position of scientific research in England was disclosed to the nation, and immediate steps were taken to remedy the existing defects. On August 25, 1914, a Committee was appointed under the Chairmanship of Lord Haldane to deal with the question of the supply of chemical products, colours, and dye-stuffs. The work of this Committee resulted in floating a company (The British Dyes Limited) subsidised by the Government.

On July 28th, 1915, an order in Council was issued which established the Committee of the Privy Council for Scientific and Industrial Research and the Advisory Council which met for the first time on August 17th, 1915. After an extensive inquiry and the holding of conferences with the learned societies of London, the Committee sent in their recommendations. As a result of this, the Government have placed a fund of a million sterling at the disposal of the Committee which has now developed into a separate department of the State. In the Parliamentary estimates, a supplemental grant of £38,050 was given for 1917.

The blue books issued on the subject give details of the allocation of funds, scope of the department, special enterprises which they want to advance, and also details of their future programme. Considerable work of the utmost importance has already been done under the auspices of that department.

Turning our attention for a while, to America, we see quite a number of national institutions there which are devoted solely to experimental work with an industrial objective such as the Bureau of Standards, Bureau of Mines, the Carnegie Institute with its modest foundation of £45,000,000 and the Smithsonian Institute. The Department of Agriculture has its Central Laboratory at Washington and experimental stations all over the country. The Forest Products Laboratory, enjoying an annual appropriation of £28,000, investigates the industrial prospects of all the forest products. The success that has attended American research is a lesson to the world.

Apart from what has been done by the Government of United States of America, the modern tendency of American manufacture towards research may be seen most strikingly by taking a few examples. Eastman Kodak Company devotes about 1 per cent of its profits to research and this comes up to about £30,000 a year. The General Electric Company, Schenectady, spends from £80,000 to £100,000 a year on research work. The Canners' Association spends yearly about £7,000 to £8,000 on its Central Laboratory.

A few years ago a firm in Germany, engaged on a variety of chemical industries, set apart £30,000,00 or Rs. 15,000,000 for research in synthetic rubber.

In the State of Mysore, our needs are great and our means are small. Within our means, we should provide liberally for research work. Men should be kept constantly and perseveringly investigating important industrial problems. Well equipped laboratories on up-to-date lines should be started. An adequate annual grant from the State funds should be provided and this grant should be increased *pari passu* with the increase in the scope of the laboratories and the progress made. To some uninformed people the costly demands of the research laboratories seem fantastic and unproductive. But it is well known that it pays and pays well in the long run. The Western nations are not accustomed to throw away good money year after year on useless investigations. They know it is a wholesome practice to experiment and conduct research work. Research has paid well in the past and is going to pay as well, if not better, in the future. It should be mentioned, however, that those who expect speedy results are bound to meet with disappointment. It is only after a number of years that a scientific body like the proposed Research Bureau would be able to show any tangible results. It took more than twenty years of patient research work before the people in England could appreciate the importance of the Rothamstead Experimental Farms. In our own case, it has taken nine years to convince the public of the importance of the Mysore Economic Conference. I am sure, if a Research Laboratory be started in the State, it would justify its creation within half-a-dozen years after it starts working.

THE INVESTMENT OF "RESERVES"*

BY B. A. COLLINS, I.C.S.,

*Registrar of Co-operative Societies,
Bihar and Orissa.*

THERE is no subject about which such diametrically opposite opinions have been expressed in India as that of the investment of the "reserves" of primary societies. The term is usually applied to all the surplus profits, which remain each year after the payment of expenses of management, etc. This is a use of nomenclature which seems never to have been contemplated by the Act. Sections 33, 34 and 43 (p) draw a distinction between the "funds of registered society" and its "reserve fund" and only require the carrying of a portion of these funds to reserve each year, though if any payments are to be made to any charitable purpose that portion cannot be less than 25 per cent of the whole. The model by-laws adopted in this Province, however, provide that all surplus profits shall be credited to the reserve fund. No by-laws have yet been made as to the investment of all or any part of it, though under a rule recently framed by Government under the Act, the Registrar has been given the power to prescribe the percentage of the reserve fund to be "held in separate investment".

The Committee on Co-operation has recommended that so long as proper provision is made to meet the demands of non-member depositors, if any, a primary society should be permitted to utilise the whole of its surplus assets in its business. This dictum has been so universally condemned that it is hardly necessary to discuss it. The idea that "the object of a society should be to

accumulate a reserve fund of this character until it obtains a capital of its own sufficient to meet all its needs and thus become independent of outside assistance," and that the central bank should maintain a reserve fund and cash reserves sufficient to maintain the stability of the movement, may be excellent theory but in the circumstances of India it is visionary and impracticable, and even undesirable.

In the first place we have to consider the outside public which invests its money in the movement. To the man in the street whose cash we wish to attract a reserve fund is a reserve fund and he regards its utilisation as working capital with the gravest suspicion. It is useless to tell him that proper provision has been made for meeting the demands of all depositors by central banks. This kind of reserve is a fluid and unstable thing and does not gain his confidence in the same way as an inviolable fund built up out of profits and invested outside the movement. This view was put forward strongly in an article in the *Capital* quoted *in extenso* in our last annual report and in the writer's opinion is eminently practical and sound. Secondly, the idea that the central banks can and should provide all the "fluid resource" of the movement is both wrong and impracticable. It is wrong because of its moral effect on the societies, since it tends to make them regard the central bank as an outside financing agency in which they have no concern, the very tendency against which we are fighting with such difficulty; while it substitutes for the great co-operative motto of "each for all and all for each" a new standard of "each for himself and the devil take the hindmost". It is impracticable, because if the central societies have to bear the whole burden of this "resource", they either cannot afford to provide proper supervision or else must charge such high rates for loans as to make our co-operative organization unworkable.

* A paper read before the Third Provincial Co-operative Conference, Bihar and Orissa.

Finally, there is the direct effect on the members themselves. Our greatest authority, Mr. Wolff, has pointed out that when a society becomes financially independent all incentive to thrift ceases. In India, as those with practical experience know, the evil is even greater. In the early years of a society's life, unless the members know that they must pay their kists in order to enable the society to repay its loan to the central bank, the members of the Committee either will not pay themselves or cannot collect the money from others. Overdue loans then accumulate or else resort is had to paper transactions, either of which demoralise the society. The past history of money dealings in the villages and the illiteracy of our members, makes it extremely unlikely that this tendency will be cured for many years to come. Practical as well as theoretical considerations, therefore, make it most undesirable that the primary societies should, at an early stage, in their careers, become independent of outside financial assistance.

On the other hand a system under which all accumulated profits are placed to reserve and invested outside the society, seems to the writer equally undesirable and impracticable. In the first place it is not understood and is resented by the members of the societies. At the commencement and up till recently we have always held it out as an inducement to members of societies that as their reserves increased they will in time be able to lower their rate of interest and this hope has been perpetuated in the twelve Main Points. The most intelligent members of societies watch the accumulation of their owned capital with interest and regard its investment, the objects of which they can with difficulty appreciate, as a plain breach of faith. It is true that they have now consented to it, though reluctantly, from motives of loyalty and gratitude, but the investments in the War Loan are regarded as a special case and they will not willingly agree to the system in its present

form. If we are to teach societies the self-government and self-reliance about which so much is talked, our system must be one which they can understand and will accept. Over and above this, the investment of all accumulated profits means the perpetuation of the present rates of interest for many years to come. Owing to the war there is little chance that our central banks will be able to attract money at rates much lower than those now offered, *i. e.*, from 7 to 8 per cent. As we strictly limit the size of our societies and finance them very cautiously, the profit made on each society which borrows at $12\frac{1}{2}$ per cent is not much more than enough to pay for the supervising and managing staff of the central bank to put sufficient to reserve and to pay a moderate dividend to capital. Any surplus is needed for the construction of buildings and the accumulation of contingency funds and special reserves. The societies cannot, therefore, lend to their members at less than $15\frac{5}{8}$ per cent or two-and-a-half annas in the rupee. But this rate though much below the normal mofussil rate of 24 to 25 per cent is still very high and while it forms a severe handicap on the members, is not beyond the reach of competition from the Mahajan. Unless we can arrange so that the individual member can hope to get his loans at $12\frac{1}{2}$ per cent in the more or less near future we shall fail to accomplish many of our objects and expose our members to the constant and invidious temptation of the money-lenders. I can see no certain prospect of a reduction in the rate of interest except in the accumulation of substantial reserves and the use of a part of them in the business of the society.

It is impossible within the limits of this paper to give fully all the calculations on which these conclusions are based but the following history of a typical society will show what I mean. A society after registration is now only advanced money for its current needs, the redemption of mortgages

being left until the members prove themselves to be honest and in earnest. The average loan taken in the first year may be put at Rs. 500, for which it will have to take five shares in the central bank and pay up Rs. 20. In the second with the election of some new members it may take Rs. 800 and pay up another Rs. 12 in shares. On this, after two years, allowing for expenses the reserve will stand at about Rs. 35. The society may then take Rs. 3,000 in all and redeem the mortgages of its members, but it will have to pay Rs. 88 more on shares and become liable for the audit cases of 1 per cent on its working capital. After one year more its reserve will not exceed Rs. 90 and with more than its total reserves invested in central bank shares on which it only earns as a rule $6\frac{1}{4}$ per cent, it is a long way from financial independence. To say that such a society should invest Rs. 90 also in Government paper is to my mind unnecessary and unfair. There is obviously no fear of its acquiring a large owned capital and so falling into bad habits in the early future; and it is unnecessary to draw too gloomy conclusions from those societies which in the early stages of the movements, received large advances without proper organization and training and so built up big reserves in a few years without adequate effort on their part.

It is impossible, however, to look only at the interests of the individual society. There is no doubt that a strong central reserve available to support the societies in any part of the province against a temporary failure of confidence or the consequences of a local famine would be a great source of strength to the movement. Such a reserve to which all societies of standing contributed would be of great moral value as teaching the members that all must stand together and help one another. In the Central Provinces all the accumulated profits of societies are invested in Government paper and held at the disposal of the Registrar or the

audit Union against such an emergency as I have described. In Bihar and Orissa we have great need of such a reserve in order both to emphasise the solidarity of the movement and to enhance the confidence of our depositors. I propose, therefore, under the powers conferred on the Registrar by Government recently to prescribe that 50 per cent of the accumulated profits of all primary societies of three years standing shall be invested outside their business and that such portion of this moiety as is not utilised in the compulsory purchase of shares in their own central societies, shall be invested in Government paper; and I intend to recommend to the Federation that these securities should be held by the Provincial Bank as a central reserve to be pledged, with the previous sanction of the Registrar, for the support of the movement in any part of the province in any time of difficulty and danger.

"Triplex glass" is the name of a material which is now being extensively used for motor-cars and aeroplanes where safety is a consideration. It consists of two layers of ordinary glass with a layer of xylonite sandwiched in between. Certain transparent cements are added, and the whole is welded together by very high pressure. The resulting material is quite transparent, but so tough that a Mauser rifle bullet fired at 25 yards has failed to perforate it. It cannot be cut through even with a diamond. The possibilities of such a material are obviously immense, and it is already being used in a variety of directions, such as for armoured cars, port-holes in mine-sweepers, and observation panels in airships, etc. It may also be used in the near future by railways for the windows of carriages, as when an accident happens serious injuries are often sustained owing to broken glass.

CO-OPERATION IN MYSORE, 1916-1917.

BY "RUSTICUS."

THE interest and value of the Report of the Registrar of Co-operative Societies in Mysore for 1916-17, which it may be stated at once are great, would have been considerably enhanced if many of the figures in it as well as the details regarding the working of individual societies had been relegated to the appendices. Statistics have their uses but it is not desirable that the reader should be overwhelmed by them as he is thereby prevented from realising their true significance. In spite of this criticism, we shall start our review of the Report with a few figures as, in no way, can progress be better illustrated. The number of societies in Mysore in 1916-17 increased from 800 to 974, the membership from 64,857 to 74,906, the working capital from Rs. 44.2 lakhs to Rs. 57.6 lakhs and the reserve fund from Rs. 1.6 lakhs to Rs. 2.35 lakhs. The progress revealed by these figures cannot but be regarded as satisfactory. We are especially glad to note the increase in the working capital from Rs. 68 to Rs. 77 per member and in the reserve fund by nearly 50 per cent; as an article by Mr. Ewbank on the rate of co-operative progress in different parts of India, published in the June number of the *Bombay Co-operation Quarterly*, showed that on the figures for 1915-16, Mysore stood below any of the major British Provinces—it was the only Native State included in the list—in these two important respects. It came above Bihar and Orissa, however, if working capital available per member in agricultural primary societies only is considered.

The registration of fourteen societies only was cancelled during the year. Possibly the number should have been larger as among the questions to which the Registrar

(Mr. K. Chandy) thinks continuous attention should be given in coming years to the weeding out of societies that do no useful work. The progress of the movement is very unequal in the different parts of the State. Whereas in Bangalore, Tumkur, Hassan and Shimoga, the average population served by a society is very much the same, varying only from 4,100 in Shimoga to 4,430 in Tumkur, in the Kadur, Chitaldrug, Kolar and Mysore Districts, it varies from 6,500 in Kadur to 12,200 in Mysore. Mysore has only 110 societies for a population of 1,342,000 people. Mr. Chandy attributes the slow progress of co-operation in the districts last mentioned to lack of the co-operative spirit due to litigiousness and uneven distribution of wealth and the want of honorary workers. He does not, however, explain why these causes should be more prominent in some parts of the State than in others.

As we have pointed out in more than one of our recent reviews of the progress of co-operation in the different provinces of British India, the note which has been sounded almost everywhere during the last year or two in regard to co-operation has been consolidation rather than rapid progress. In no other country has co-operation made such strides in so short a time as it has in India but it has become more and more apparent that, satisfactory as the advance has been in many ways, there are weak points in the co-operative position which require strengthening. It is most fortunate that neither the Registrars nor the Governments under which they serve show the slightest desire to gloss these over. Of the weak spots in Mysore, perhaps the weakest is the tendency of the members of the Managing Committees of Societies to look upon their societies as formed for their own private and particular benefit. A careful enquiry was made during the year in regard to the percentage of loans taken by Committee members to the total loans outstanding against all members. In no district

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The enquiry into the advantage taken by office-bearers in societies of their position was not the only enquiry of interest which the Department carried out during the year. An attempt was made to ascertain how far rural societies have really improved the condition of their members. Two societies were selected in each Inspector's range, one considered good and the other average, only societies which had been in existence for four years being chosen. The survey was conducted in 32 taluks and covered 48 societies operating in 170 villages. Altogether 2,114 cases were investigated. The result was to show that the total indebtedness of the members when the societies started was Rs. 5,54,716 or an average of Rs. 260 per head whereas it is now Rs. 5,55,296. The figures as Mr. Chandy says, are remarkable and, he might have added, extremely disappointing. They show not only that indebtedness has remained practically stationary but also that members are indebted to a greater extent to *sowcars* than to their societies, the figures being roughly indebtedness to the extent of three and a half lakhs to the former and two and a half lakhs to the latter. The Registrar thinks that the reason why the grip of the *sowcar* has not been more appreciably relaxed is that he gives longer terms and is more accommodating until he finally absorbs the debtor. What the figures appear to show is the necessity for ascertaining the financial position of applicants for membership of co-operative societies. It may be that some of them are past helping, in which case they

discoveries were most frequently made. Factories in general grow great by being well managed. But even in the larger factories, employers at times learned that they were overlooking leakages of time and labour which seriously impaired their total efficiency. Waste of time in the distribution of material and the allotment of tasks will arise in any factory where there is not as vigilant a watch over such details as there is over the financial department.

It has often occurred to me that employers might gain greatly by openly consulting with their workers as to matters of organization. In multitudes of cases they gain by the inventions of employees; and the more judicious and enterprising have long been wont to encourage invention. But they might equally gain by taking hints from their workers as to organization in general. Such hints actually do pass from workers to labour organizers, who sometimes pass them on to employers with beneficial results. But the price of perfect organization, like the price of liberty, is eternal vigilance; and there should be a constant openness to new discovery in these matters. When it is realized that organization means profit, and that better organization thus means not only increase in wage-paying power but the possible continuance of employment where otherwise it might be arrested, there is seen to be a new reason for habitual consultation between employers and employed.

In the cases of which I have spoken, gain has come from conference among employers who previously had not conferred; there we have one of the evidences of the importance of trade societies in general. Too often, doubtless, business men are reluctant to give information which will help their competitors; but in this as in many other directions the standard of public spirit is steadily rising. War at least reveals that there is a community of national interest which involves every kind of national efficiency. Weak

industries are national weaknesses. A few which cannot be made really strong had better just be abandoned; but it is one of the standing lessons of trade experience that the difference between weakness and strength may just be bad organization.

The captain of industry in short, must see to it that he not only makes the utmost use of "science" in all his mechanical processes but he himself is scientific in all the departments of his concern. To put it bluntly, he will have to work harder in future. In no country have business men had a larger share of leisure in modern times than in Britain—at least in none of the leading industrial countries where business is carried on a great scale. Much of this comparative lack of stress was certainly due to the Free Trade conditions of a long past. But the best of fiscal systems cannot in future avert the need for a great increase of productive power in this country. By no other means can it pay off its debts.

To a certain extent the required increase will undoubtedly have to be secured by combinations. The large factory has, up to a certain point, inalienable advantages over the small; and in some industries—the chemical, for instance—the gain from combining a large number of modes of production is overwhelming. This has been abundantly evident in Germany. But combination is not the last word, or the only word, in the extension of production. There is a point at which a giant factory runs multiplying riots of inefficiency, just because the perfect co-ordination of everything calls for more and more stress of attention. I have known a large factory driven to abolish one of its departments and rely on outside work where before it had supplied itself. It is significant that in the past evolution of animal life the giant organisms have mostly died out; and the elephant, in its turn, seems likely to disappear. I do not press the analogy which could easily mislead us if we followed it confidently; but it is suggestive.

The measure of fitness, in any case, is the same all round—success. If a British industry is found to lag in competition with a foreign one, the sane course is not to begin to call for tariffs but to ask first whether it is not behind in point of organization. I could name some which have notoriously been hampered by long-protracted failure of co-operation between employers and employed. And wherever an industry is found to be paying unduly low wages, defective organization is one of the causes first to be looked for. If employers all round will more and more exchange ideas for the general good, and further try to elicit the ideas of their 'hands', a great and helpful impulse may be given.

One hopes for much, in this way, from the new commercial journalism, which cheerfully presumes to teach business men their business. In the United States, for years past, there have been professional advisers of business concerns, who undertake to tell a lagging firm, after close inspection, where it is lacking in point of management. It is to be feared that British firms will in general be less ready than American to resort to such guidance. Fear of disclosure will operate, as well as unwillingness to believe that any man can be competent to advise as to the management of business of every kind. One fear I believe to be ill-founded; though there are experts and experts, in this as in other walks of life. Given honesty—and as to this business men can consult with each other—the experienced man with an eye for organization may be quite as useful as the sanitary inspector—who is not infallible either.

Pending the development of the organizing expert, however, much benefit might be had from a spirit of mutual help among the heads of businesses themselves. And perhaps the war may have some effect in promoting fraternity of that kind though it is not a price that an of us would have proposed to pay.

INDUSTRIAL RESEARCH IN THE MYSORE STATE.

BY S. G. SASTRY, M. SC., F. C. S., ETC.

WE cannot face the industrial future of the Mysore State equipped only with good intentions and ideas of last century. There must be a change, but no change is possible without a thorough understanding of the needs of the present day scientific requirements which are essential for the success of the industries of the State. Nine years have elapsed since the inception of the Economic Conference, and the Conference has justified its existence by its many-sided activities and it has proved its usefulness in that practically the whole body of the Conference voted for its being placed on a permanent footing as a separate department of the State. The policy of the department is to encourage suitable industries in the State and whenever required to give a helping hand to the manufacturer, either in the form of grants of money, loans, or supplying technical information. This technical information can only be obtained by constant research by expert scientific men.

Success in research depends on a large body of willing and highly skilled workers and also on the facilities given to them to carry on the investigation. Scientific research demands prolonged and arduous labour and the men who tackle the important problems should be industrious and patient. The undertaking is costly and requires financial support from the Government. The time has arrived for the Government of His Highness the Maharaja of Mysore to provide for industrial research in the State.

About the year 1900, the Government of Great Britain and Ireland took the important step of enquiring into the problem of giving State help and encouragement for organized industrial research so as to benefit the trades and industries of England. The enquiry led to the establishment of the National

Physical Laboratory in 1902 with a grant from the State treasury. About the same time, the Imperial Institute began to undertake researches in relation to industries.

It was not, however, until the war broke out that the serious position of scientific research in England was disclosed to the nation, and immediate steps were taken to remedy the existing defects. On August 25, 1914, a Committee was appointed under the Chairmanship of Lord Haldane to deal with the question of the supply of chemical products, colours, and dye-stuffs. The work of this Committee resulted in floating a company (The British Dyes Limited) subsidised by the Government.

On July 28th, 1915, an order in Council was issued which established the Committee of the Privy Council for Scientific and Industrial Research and the Advisory Council which met for the first time on August 17th, 1915. After an extensive inquiry and the holding of conferences with the learned societies of London, the Committee sent in their recommendations. As a result of this, the Government have placed a fund of a million sterling at the disposal of the Committee which has now developed into a separate department of the State. In the Parliamentary estimates, a supplemental grant of £38,050 was given for 1917.

The blue books issued on the subject give details of the allocation of funds, scope of the department, special enterprises which they want to advance, and also details of their future programme. Considerable work of the utmost importance has already been done under the auspices of that department.

Turning our attention for a while, to America, we see quite a number of national institutions there which are devoted solely to experimental work with an industrial objective such as the Bureau of Standards, Bureau of Mines, the Carnegie Institute with its modest foundation of £45,000,000 and the Smithsonian Institute. The Department of Agriculture has its Central Laboratory at Washington and experimental stations all over the country. The Forest Products Laboratory, enjoying an annual appropriation of £28,000, investigates the industrial prospects of all the forest products. The success that has attended American research is a lesson to the world.

Apart from what has been done by the Government of United States of America, the modern tendency of American manufacture towards research may be seen most strikingly by taking a few examples. Eastman Kodak Company devotes about 1 per cent of its profits to research and this comes up to about £30,000 a year. The General Electric Company, Schenectady, spends from £80,000 to £100,000 a year on research work. The Cannery Association spends yearly about £7,000 to £8,000 on its Central Laboratory.

A few years ago a firm in Germany, engaged on a variety of chemical industries, set apart £30,000,00 or Rs. 15,000,000 for research in synthetic rubber.

In the State of Mysore, our needs are great and our means are small. Within our means, we should provide liberally for research work. Men should be kept constantly and perseveringly investigating important industrial problems. Well equipped laboratories on up-to-date lines should be started. An adequate annual grant from the State funds should be provided and this grant should be increased *pari passu* with the increase in the scope of the laboratories and the progress made. To some uninformed people the costly demands of the research laboratories seem fantastic and unproductive. But it is well known that it pays and pays well in the long run. The Western nations are not accustomed to throw away good money year after year on useless investigations. They know it is a wholesome practice to experiment and conduct research work. Research has paid well in the past and is going to pay as well, if not better, in the future. It should be mentioned, however, that those who expect speedy results are bound to meet with disappointment. It is only after a number of years that a scientific body like the proposed Research Bureau would be able to show any tangible results. It took more than twenty years of patient research work before the people in England could appreciate the importance of the Rothamstead Experimental Farms. In our own case, it has taken nine years to convince the public of the importance of the Mysore Economic Conference. I am sure, if a Research Laboratory be started in the State, it would justify its creation within half-a-dozen years after it starts working.

THE INVESTMENT OF "RESERVES"*

BY B. A. COLLINS, I.C.S.,

*Registrar of Co-operative Societies,
Bihar and Orissa.*

THERE is no subject about which such diametrically opposite opinions have been expressed in India as that of the investment of the "reserves" of primary societies. The term is usually applied to all the surplus profits, which remain each year after the payment of expenses of management, etc. This is a use of nomenclature which seems never to have been contemplated by the Act. Sections 33, 34 and 43 (p) draw a distinction between the "funds of registered society" and its "reserve fund" and only require the carrying of a portion of these funds to reserve each year, though if any payments are to be made to any charitable purpose that portion cannot be less than 25 per cent of the whole. The model by-laws adopted in this Province, however, provide that all surplus profits shall be credited to the reserve fund. No by-laws have yet been made as to the investment of all or any part of it, though under a rule recently framed by Government under the Act, the Registrar has been given the power to prescribe the percentage of the reserve fund to be "held in separate investment".

The Committee on Co-operation has recommended that so long as proper provision is made to meet the demands of non-member depositors, if any, a primary society should be permitted to utilise the whole of its surplus assets in its business. This dictum has been so universally condemned that it is hardly necessary to discuss it. The idea that "the object of a society should be to

accumulate a reserve fund of this character until it obtains a capital of its own sufficient to meet all its needs and thus become independent of outside assistance," and that the central bank should maintain a reserve fund and cash reserves sufficient to maintain the stability of the movement, may be excellent theory but in the circumstances of India it is visionary and impracticable, and even undesirable.

In the first place we have to consider the outside public which invests its money in the movement. To the man in the street whose cash we wish to attract a reserve fund is a reserve fund and he regards its utilisation as working capital with the gravest suspicion. It is useless to tell him that proper provision has been made for meeting the demands of all depositors by central banks. This kind of reserve is a fluid and unstable thing and does not gain his confidence in the same way as an inviolable fund built up out of profits and invested outside the movement. This view was put forward strongly in an article in the *Capital* quoted *in extenso* in our last annual report and in the writer's opinion is eminently practical and sound. Secondly, the idea that the central banks can and should provide all the "fluid resource" of the movement is both wrong and impracticable. It is wrong because of its moral effect on the societies, since it tends to make them regard the central bank as an outside financing agency in which they have no concern, the very tendency against which we are fighting with such difficulty; while it substitutes for the great co-operative motto of "each for all and all for each" a new standard of "each for himself and the devil take the hindmost". It is impracticable, because if the central societies have to bear the whole burden of this "resource", they either cannot afford to provide proper supervision or else must charge such high rates for loans as to make our co-operative organization unworkable.

* A paper read before the Third Provincial Co-operative Conference, Bihar and Orissa.

Finally, there is the direct effect on the members themselves. Our greatest authority, Mr. Wolff, has pointed out that when a society becomes financially independent all incentive to thrift ceases. In India, as those with practical experience know, the evil is even greater. In the early years of a society's life, unless the members know that they must pay their kists in order to enable the society to repay its loan to the central bank, the members of the Committee either will not pay themselves or cannot collect the money from others. Overdue loans then accumulate or else resort is had to paper transactions, either of which demoralise the society. The past history of money dealings in the villages and the illiteracy of our members, makes it extremely unlikely that this tendency will be cured for many years to come. Practical as well as theoretical considerations, therefore, make it most undesirable that the primary societies should, at an early stage, in their careers, become independent of outside financial assistance.

On the other hand a system under which all accumulated profits are placed to reserve and invested outside the society, seems to the writer equally undesirable and impracticable. In the first place it is not understood and is resented by the members of the societies. At the commencement and up till recently we have always held it out as an inducement to members of societies that as their reserves increased they will in time be able to lower their rate of interest and this hope has been perpetuated in the twelve Main Points. The most intelligent members of societies watch the accumulation of their owned capital with interest and regard its investment, the objects of which they can with difficulty appreciate, as a plain breach of faith. It is true that they have now consented to it, though reluctantly, from motives of loyalty and gratitude, but the investments in the War Loan are regarded as a special case and they will not willingly agree to the system in its present

form. If we are to teach societies the self-government and self-reliance about which so much is talked, our system must be one which they can understand and will accept. Over and above this, the investment of all accumulated profits means the perpetuation of the present rates of interest for many years to come. Owing to the war there is little chance that our central banks will be able to attract money at rates much lower than those now offered, *i. e.*, from 7 to 8 per cent. As we strictly limit the size of our societies and finance them very cautiously, the profit made on each society which borrows at $12\frac{1}{2}$ per cent is not much more than enough to pay for the supervising and managing staff of the central bank to put sufficient to reserve and to pay a moderate dividend to capital. Any surplus is needed for the construction of buildings and the accumulation of contingency funds and special reserves. The societies cannot, therefore, lend to their members at less than $15\frac{5}{8}$ per cent or two-and-a-half annas in the rupee. But this rate though much below the normal mofussil rate of 24 to 25 per cent is still very high and while it forms a severe handicap on the members, is not beyond the reach of competition from the Mahajan. Unless we can arrange so that the individual member can hope to get his loans at $12\frac{1}{2}$ per cent in the more or less near future we shall fail to accomplish many of our objects and expose our members to the constant and invidious temptation of the money-lenders. I can see no certain prospect of a reduction in the rate of interest except in the accumulation of substantial reserves and the use of a part of them in the business of the society.

It is impossible within the limits of this paper to give fully all the calculations on which these conclusions are based but the following history of a typical society will show what I mean. A society after registration is now only advanced money for its current needs, the redemption of mortgages

being left until the members prove themselves to be honest and in earnest. The average loan taken in the first year may be put at Rs. 500, for which it will have to take five shares in the central bank and pay up Rs. 20. In the second with the election of some new members it may take Rs. 800 and pay up another Rs. 12 in shares. On this, after two years, allowing for expenses the reserve will stand at about Rs. 35. The society may then take Rs. 3,000 in all and redeem the mortgages of its members, but it will have to pay Rs. 88 more on shares and become liable for the audit cases of 1 per cent on its working capital. After one year more its reserve will not exceed Rs. 90 and with more than its total reserves invested in central bank shares on which it only earns as a rule $6\frac{1}{4}$ per cent, it is a long way from financial independence. To say that such a society should invest Rs. 90 also in Government paper is to my mind unnecessary and unfair. There is obviously no fear of its acquiring a large owned capital and so falling into bad habits in the early future; and it is unnecessary to draw too gloomy conclusions from those societies which in the early stages of the movements received large advances without proper organization and training and so built up big reserves in a few years without adequate effort on their part.

It is impossible, however, to look only at the interests of the individual society. There is no doubt that a strong central reserve available to support the societies in any part of the province against a temporary failure of confidence or the consequences of a local famine would be a great source of strength to the movement. Such a reserve to which all societies of standing contributed would be of great moral value as teaching the members that all must stand together and help one another. In the Central Provinces all the accumulated profits of societies are invested in Government paper and held at the disposal of the Registrar or the

audit Union against such an emergency as I have described. In Bihar and Orissa we have great need of such a reserve in order both to emphasise the solidarity of the movement and to enhance the confidence of our depositors. I propose, therefore, under the powers conferred on the Registrar by Government recently to prescribe that 50 per cent of the accumulated profits of all primary societies of three years standing shall be invested outside their business and that such portion of this moiety as is not utilised in the compulsory purchase of shares in their own central societies, shall be invested in Government paper; and I intend to recommend to the Federation that these securities should be held by the Provincial Bank as a central reserve to be pledged, with the previous sanction of the Registrar, for the support of the movement in any part of the province in any time of difficulty and danger.

“Triplex glass” is the name of a material which is now being extensively used for motor-cars and aeroplanes where safety is a consideration. It consists of two layers of ordinary glass with a layer of xylonite sandwiched in between. Certain transparent cements are added, and the whole is welded together by very high pressure. The resulting material is quite transparent, but so tough that a Mauser rifle bullet fired at 25 yards has failed to perforate it. It cannot be cut through even with a diamond. The possibilities of such a material are obviously immense, and it is already being used in a variety of directions, such as for armoured cars, port-holes in mine-sweepers, and observation panels in airships, etc. It may also be used in the near future by railways for the windows of carriages, as when an accident happens serious injuries are often sustained owing to broken glass.

CO-OPERATION IN MYSORE, 1916-1917.

BY "RUSTICUS."

THE interest and value of the Report of the Registrar of Co-operative Societies in Mysore for 1916-17, which it may be stated at once are great, would have been considerably enhanced if many of the figures in it as well as the details regarding the working of individual societies had been relegated to the appendices. Statistics have their uses but it is not desirable that the reader should be overwhelmed by them as he is thereby prevented from realising their true significance. In spite of this criticism, we shall start our review of the Report with a few figures as, in no way, can progress be better illustrated. The number of societies in Mysore in 1916-17 increased from 800 to 974, the membership from 64,857 to 74,906, the working capital from Rs. 44'2 lakhs to Rs. 57'6 lakhs and the reserve fund from Rs. 1'6 lakhs to Rs. 2'35 lakhs. The progress revealed by these figures cannot but be regarded as satisfactory. We are especially glad to note the increase in the working capital from Rs. 68 to Rs. 77 per member and in the reserve fund by nearly 50 per cent; as an article by Mr. Ewbank on the rate of co-operative progress in different parts of India, published in the June number of the *Bombay Co-operation Quarterly*, showed that on the figures for 1915-16, Mysore stood below any of the major British Provinces—it was the only Native State included in the list—in these two important respects. It came above Bihar and Orissa, however, if working capital available per member in agricultural primary societies only is considered.

The registration of fourteen societies only was cancelled during the year. Possibly the number should have been larger as among the questions to which the Registrar

(Mr. K. Chandy) thinks continuous attention should be given in coming years to the weeding out of societies that do no useful work. The progress of the movement is very unequal in the different parts of the State. Whereas in Bangalore, Tumkur, Hassan and Shimoga, the average population served by a society is very much the same, varying only from 4,100 in Shimoga to 4,430 in Tumkur, in the Kadur, Chitaldrug, Kolar and Mysore Districts, it varies from 6,500 in Kadur to 12,200 in Mysore. Mysore has only 110 societies for a population of 1,342,000 people. Mr. Chandy attributes the slow progress of co-operation in the districts last mentioned to lack of the co-operative spirit due to litigiousness and uneven distribution of wealth and the want of honorary workers. He does not, however, explain why these causes should be more prominent in some parts of the State than in others.

As we have pointed out in more than one of our recent reviews of the progress of co-operation in the different provinces of British India, the note which has been sounded almost everywhere during the last year or two in regard to co-operation has been consolidation rather than rapid progress. In no other country has co-operation made such strides in so short a time as it has in India but it has become more and more apparent that, satisfactory as the advance has been in many ways, there are weak points in the co-operative position which require strengthening. It is most fortunate that neither the Registrars nor the Governments under which they serve show the slightest desire to gloss these over. Of the weak spots in Mysore, perhaps the weakest is the tendency of the members of the Managing Committees of Societies to look upon their societies as formed for their own private and particular benefit. A careful enquiry was made during the year in regard to the percentage of loans taken by Committee members to the total loans outstanding against all members. In no district

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COCOANUT CULTIVATION IN TUMKUR DISTRICT.

BY G. SANTAVIRAPPA, B.A.,

District Economic Superintendent, Tumkur.

COCOANUT cultivation is an important agricultural industry and is of commercial interest. In Ceylon it is called the Sinhalese wealth, the gifted tree of the Sinhalese, a tree of varied and infinite uses to him. In Cochin and Travancore, in it are involved the entire resources of the poor man. And what part does it play as an agricultural produce in the Tumkur District which has the largest area in the Province under cocoanut cultivation? It is proposed to consider the possibilities of the extension of its cultivation and of its fibre industry.

Its cultivation is at present confined to a particular zone in the Tumkur District. It has thrived in the extreme western portion of the District comprising the Taluks of Chickanaikanahalli and Tiptur including Turuvekere Sub-Taluk. The flourishing area begins with Dasudi village in the north, passes through Kenkere, Huliya, Handankere, Shettikere, Honnavalli, Tiptur, Nona-vinkere, Turuvekere and ends with Dabbe-ghatta in the south. The cocoanut zone is situated between $13^{\circ} 5'$ and $53^{\circ} 40'$ North Latitude and $76^{\circ} 30'$ and $76^{\circ} 40'$ East Longitude. It is bounded by Dasudi village (which has 125 acres of cocoanut gardens) on the north, Kandikere (200 acres) on the east, Dobbeghatta (109 acres) on the south, and Kidakanhalli (240 acres) on the west, *i.e.*, it is about forty miles from north to south and fifteen miles east to west. The cocoanut zone in the District is about 600 square miles. It extends slightly into the Taluks of Sira and Gubbi in the east, and in the west of it there are parts of Hosadrug Taluk in the Chitaldrug District, Kadur Taluk in the

Kadur District, and Arsikere and Chan-rayapatna Taluks in the Hassan District.

In the Tumkur District there are about 35,000 acres under cocoanut cultivation of which 30,000 acres are in the cocoanut zone proper. In this cocoanut area there are 421 villages which have in each more than ten acres devoted to cocoanut cultivation of which one village, *viz.*, Kenkere has 546 acres which is the highest extent for a single village in the District. Three villages have more than 300 acres in each, *viz.*, Honnavalli 382 acres, Tiptur 344 acres, and Shettihalli 320 acres, fifteen villages have each between 200 and 300 acres, and seventy-five villages have each between 100 and 200 acres.

An examination of the Revenue accounts of the past few years discloses an unexpected fact that the area under this important crop in these two taluks is almost constant and this surprising condition is largely due to the fact that the land in this area, which is undoubtedly suited for this cultivation, is locked up in date reserves. It is admitted on all hands that the cocoanut plant does not thrive in any and every kind of land. It generally requires a loose and friable soil, and a damp atmosphere. Hence it is that it is grown on thousands of acres along the sea coast. But the table-land of Mysore which has not the sea coast, has another advantage in that it has fertile valleys excellently suited for cocoanut cultivation. Wherever the date palm thrives, there the cocoanut tree is found to thrive as well. In the interests of the revenue of the Excise Department, something like 75,000 acres of assessed and unassessed land in Tiptur and Chickanaikanahalli Taluks are included in the Date Reserve. It is a matter for serious investigation to find out how much of this reserve land is absolutely necessary for the purpose of toddy supply and how much in suitable localities could be liberated for being given out for cocoanut plantations. It is no good setting free five acres here and five acres there, and giving it out to half-a-dozen

indifferent small cultivators. The idea of plantations and large estates should be developed and persons who are in a position to invest a large capital on the formation of such estates should be induced.

The influence of the activities of the Economic Conference has awakened the minds of people in the direction of the country's economic development as a whole. There are persons who have come to look far ahead of individual interests and are able to appreciate the country's interests as involved in the activities of groups of people. The formation of Joint-stock Companies, and the creation of large landed estates are clear evidence of the interests of team-workers.

To apply the above principle to cocoanut cultivation it is necessary to select blocks of lands of fifty acres and above to form cocoanut estates and to frame a set of rules on the lines of those which have been issued for the creation of large landed estates with such modifications as are called for in respect of this special agricultural industry which does not give any results within seven to ten years from the year of planting. The more liberal the concessions, the faster would the large cocoanut estates come into existence and much richer would be the economic condition of the country. The selection of blocks might be in the first instance confined to the area defined above as cocoanut zone. This step appears to be called for not only with a view to expand cocoanut cultivation but also to hasten the development of cocoanut fibre industry of which at present nothing is known in our country.

The extraction of cocoanut fibre forms an important industry in Ceylon, Cochin, Travancore and Malabar. In Ceylon it is a modern industry worked by up-to-date machinery. Fibre is extracted from tens of thousands of husks every day in more than a dozen factories. The long husks are crushed in a crushing machine and thrown into water for retting, from which they are taken after

two days and are treated in a set of machines called breakers, insiders and cleaners, called as such in accordance with the function the respective part performs. These parts are circular iron wheels three feet in diameter which revolve at high speed and have rims which are twelve to fourteen inches in width and are studded with iron spikes. The husks are held against the revolving drums and the spikes remove firstly the woody part and secondly shorter fibres, leaving at last the long coarse fibre which is called bristle fibre and is used for making brushes, etc. The long fibre is next washed and combed to remove further any more short fibre, if there be any, and then formed into hanks. The shorter fibre is fanned in a separate machine called winnower, dried and cleared and used for mattresses, etc. This forms a very big industry in Ceylon.

In Cochin and Travancore, the extraction of fibre is an ancient cottage industry, where no sort of labor-saving machinery is used. The husks are buried in pits for over six months along the margins of rivers and back-waters. Later on they are taken out and beaten with sticks into fibre. It is a common sight in the gardens alongside the rivers and back-waters. The women folk of the Tiya community are particularly occupied in this business. After the fibre is dried, it is made up into coir. All this fibre may be classed as mattress fibre. Next they make yarn out of it which process is also cottage industry. There are factories huge in magnitude to which yarn is carried and mattresses, rugs, coir carpets, etc., are made there.

It may be questioned why it is that machinery is not employed here to make fibre. It appears that in Cochin and Travancore, it has firmly settled down into a cottage industry and by displacing it by machinery, thousands of women and children whose sole means of livelihood is coir making will be thrown out of employment and will not be able to find any other agricultural or industrial occupation. In other words, labour is abundant and as such this industry should

be preserved as a cottage industry with a view to provide work to so many hands. In fact it is the most important occupation ever going on in many villages of these two countries.

Now the above conditions may be compared and contrasted with those existing in Mysore in respect of this industry. In the countries referred to above, the cultivation of cocoanut is so very extensive that husks are plenty and that fibre or yarn from one place to another is very small as they are carried on water in canoes. There is no dry husk of the kind in Mysore due to the fact that copra is made by means of drying the ripe cocoanut in the sun, soon after removing the husk and breaking the nut into two parts. Thus every husk is available for purposes of extracting fibre. Above all the supply of water for soaking the husks is enormous and inexhaustible.

In Mysore the cultivation is limited and is scattered over in small bits of cocoanut gardens. There are no cocoanut estates in blocks of thousands of acres. The cost of transmitting husks on land would be far more than what it would be on water. The period involved in converting green cocoanut into copra is about nine months at the end of which the husk becomes thoroughly unfitted for extraction of fibre. In this way more than 50 per cent of the husk is rendered useless. The supply of water for soaking is scarce.

This difference in conditions appear to account for the utter absence of any cocoanut fibre industry in Mysore. But the more certain reason appears to be that the question has not been investigated and that no authoritative conclusion has been arrived at to show whether the industry could be introduced with improved appliances and worked as a paying concern. The shadow of misgiving has gone on assuming darker and darker appearance in the absence of a spirit of investigation. Our mind in this respect is burdened with presumption. We say that

the industry will fail without an examination of facts and without making experiments with the local material.

It is believed that the superior quality of Tiptur copra is due primarily to the slow process of drying. It may or may not be so. But there is another aspect of the question which from the point of view of an economist is very important. It is that the money in the copra is allowed to lie idle for nine months. The currency of the money is arrested. The owner of copra suffers considerably because he waits for its conversion into money, and because he borrows in the meantime paying heavy interest. He may be able to get a little more money at the end of nine months. But the effect of waiting is depressing.

Making allowance for all traditional defects in the system of making copra, it may be considered whether sufficient quantity of green husk could be had in the country to start a coir factory. The 30,000 acres of cocoanut land, leaving away 4,000 acres scattered in the area other than the cocoanut zone, would roughly yield 6,00,00,000 cocoanuts annually. Twenty-five per cent of this production may safely be taken as cocoanut used in green condition. This means that 1,50,00,000 of husks could be collected for extraction of fibre. In other words, with an efficient organization, it is not difficult to supply 50,000 husks a day. This quantity of husk is sufficient to work a big factory. Even with a supply of 10,000 husks a day, a fairly big factory could be worked. To obtain this supply there should be an extent of 1,500 acres of cocoanut land within a radius of five to six miles. Within the cocoanut zone a dozen such centres could be easily selected. Take Huliya, for instance, as one centre. Taking villages with more than 100 acres under cocoanut cultivation within a radius of six miles, not taking into account those with less than 100 acres, there are fourteen villages giving 2,600 acres. A glance at the map whereon villages having a cocoanut area of over 100 acres are marked, will show that Handankere, Honnavalli, Nonavinkere and Turuvekere could each form a centre commanding 1,500 acres and more, within a radius of six miles.

This quantity of raw material which has a lot of money in it is now being either burnt

or thrown away to rot. How much money is thus lost is not thought of by the cocoanut growers. For the purpose of this note that 25 per cent of the production is taken as being consumed as green cocoanut. It will give 1,50,00,000 husks as available for extraction of fibre.

In Ceylon it is estimated that 10,000 husks yield 20 cwts of fibre. In South India they estimate that six cocoanuts give 1 lb. of dried fibre. It may be taken at 15 cwts per ten thousand husks here. Thus 1,50,00,000 husks should give 22,500 cwts of fibre or about one lakh maunds of fibre. For some years past fibre imported from Calicut is being sold in the Mysore markets at an average rate of Re. 1-8-0 per maund. We are therefore losing every year one and a half lakhs of rupees. If the industry is properly developed and the fibre trade is well organized, there can be no doubt that the District could realize two to three lakhs of rupees every year from cocoanut fibre.

The above account relates to cocoanut production of 30,000 acres only. There are besides this area, 4,000 acres in the District in other taluks than Tiptur and Chikanayakanahalli and the following extents in other Districts.

Hassan District	...	22,557 acres	
out of which Arsikere has	10,953	„	
Chenrayapatna	...	9,616	„
Kadur District	...	5,427	„
out of which Kadur Taluk has	4,553	„	
Chitaldrug District	...	7,773	„
of which 6,400 acres are			
in Hosdurga Taluk			
Bangalore District	...	4,026	„
Mysore District	...	5,883	„
Kolar District	...	921	„
Shimoga District	...	238	„

It may be noted that the taluks of Arsikere and Chenrayapatna in the Hassan District, Kadur Taluk in the Kadur District, and Hosadurg Taluk in the Chitaldrug District, which are contiguous to the cocoanut zone in this District, have very extensive cocoanut cultivation. In working out a comprehensive scheme of coir works, this fact will greatly help the solution of the question.

This note is only intended to suggest a closer study and investigation of the subjects of (i) extension of cocoanut cultivation, and (ii) starting of a cocoanut fibre factory in a central place.

POLYTECHNIC AS A FACTOR IN INDUSTRIAL EVOLUTION.

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THE temporary restrictions of the produce of industries in the West has been conspicuous for the inauguration of great industrial activity in the East.

The restrictions of maritime commerce by closing certain Overseas markets for raw produce and by greatly reducing importation has created greater inland markets for skilled workmanship and the rapidly increasing prices of goods, caused by great excess in demand over the supply of markets, has stimulated the institution of new centres of production. Other countries are making strenuous efforts to capture these commercial opportunities by the evolution of their industrial resources and although the initial costs and difficulties of procuring or preparing the necessary machinery are rapidly increasing, those countries who had the foresight to make the necessary outlay have already been abundantly recompensed.

It is very advisable that we should not be behind in doing our utmost to avail ourselves of these present industrial opportunities. Obviously the primary need in any such evolution is knowledge. One of the greatest needs of this State to-day is for skilled workmen and the organization of industrial education should be one of the most urgent matters for state consideration.

A description of the arrangement, organization and aims of the most efficient training institutions of Western education together with a few of the ideas upon the theory of training should therefore be of value.

First it is necessary to give a general idea of the constitution of the London Polytechnic. Such an institution must obviously consist of a huge building or conglomeration of

buildings generally placed in the most thickly populated business centres and always within easy access by railway, electric tramways, etc., for students who daily attend from within a radius of thirty miles. Students studying every technique and coming from every nation and country under the sun and comprised not only of those who can speak English but students native to Europe, Asia, America, Africa and Australia.

The Polytechnic building consists of many floors of flats frequently six, in order to make the departments as compact and readily accessible as possible. Lifts both for passengers and goods connect these floors and there are also central courtyards for light and games, etc., and roof gardens and large recreation grounds. Each department with its many divisions and sub-divisions is contained in one special set of rooms especially designed to fit its particular requirements. A large department will occupy a whole floor or flat and smaller departments occupy special sets of rooms only.

The building usually contains a common refreshment hall, for the divisions consequent upon caste do not obtain credence in Europe. All types of meals are served at any time of the day from 6 A. M. until 10-30 at night.

There is a huge common library and in connection with it the debating, social, civil and the art, literary, scientific, fresh air, sports, research lecture societies that always find space in such a public place. Gymnasium hall with gallery, swimming bath, racing track and recreation grounds equipped for all out and indoor games—tennis, football, boxing, fencing, singlestick, quaterstaff, baseball, hockey, cricket, croquet, bowls, etc. Each game with its own association giving displays of skill during the year and is frequently of considerable public renown and also a large theatre in addition to the class lecture theatres with a very considerable seating capacity and is shared by the elocution school and the many societies; lectures and plays are of nightly occurrence.

Each department also usually contains its own special museum and small technical library. The subjects, forming the curriculum of the syllabus during the day, are direct vocational courses. The evening classes are multitudinous and serve the demands of the workers who are engaged during the day and who attend these classes for subjects auxiliary to their daily occupation and in addition to the classes and departments similar to those of daily tutors. These consist of special practical and theoretical classes in special subjects, such for instance as paper making, oxyacetylene welding, colour photography, halftone printing, lithography, glass making and blowing, furniture design, shop-keeping and display, playacting, industrial chemistry, etc., etc., and also an arranged series of lectures by experts upon wide range of subjects, technical training in every subject being catered for.

GENERAL DEPARTMENTS.

Engineering and Building,
Electrical,
Chemistry,
Physics,
Domestic Sciences,
Art and Crafts,
Secondary schools for boys,
" " " girls,
Commercial school,
Astronomy,
Elocution,
Biology, and
Geology

with their numerous divisions and sub-divisions of special subjects.

In addition to these, evening continuation classes are held at many centres in the immediate neighbourhood and also the London Country Council practical trade classes. These additional evening classes utilizing the day elementary school rooms and usually consist of a course of twenty-five to thirty lessons for which a small nominal fee is charged, tools and equipment being supplied;

if the students bring their own materials they keep the results.

GENERAL ARRANGEMENT OF THE BUILDING AND ORGANIZATION.

The basement is occupied with the heavy machinery and engines of the Engineering School and the heavy machines of the Building school, some of which schools undertake the construction of additional class rooms and out buildings as part of the school studies, and the engines supplying the power, light and heating and ventilating arrangements to the whole building, swimming bath, plaster workshop, modelling, statuary and stone carving.

The ground floor usually consists of offices, teachers' common rooms and conveniences, the library, electrical department, gymnasium, theatre, refreshment hall, general stores and shops, etc. The other floors being divided according to the size and necessity of the various departments: the top floors being always allotted for art and craft subjects and the roof if flat being frequently arranged as a roof garden.

These departments are not limited to work in their own subjects but correlated classes pass from one department to another during the day and evening. One very particular benefit resulting from such an educational institution is the free interchange of ideas and assistance upon all subjects resulting in not a little friendly competitions and the stimulation of energies and the ease with which any project can be carried forward with every facility and expert assistance adjacent.

Usual time of classes:—8-30 A.M. to 1 P.M.

2 P.M. till 5 P.M.

6-30 P.M. till 8-30
or 10 P.M.

The time between the classes, after indulging in the necessary refreshment, is spent in individual study and research or recreation, each department freely helping the others in the completion of any object, both teachers and students working informally together, the staff numbering only 1,000.

Usually at least one large *conversazione*, sports day, and Bazaar or sale of work is arranged per year amongst the combined departments. In such a polytechnic it is the object to give expert knowledge upon every subject although the various institutions usually obtain fame individually in various enterprises; for instance, Regent St. Polytechnic is renowned for the organization of world travel, Briton for its school of building, Battersen for design and craftwork and domestic sciences, Chelsea for figure painting and Bolt Court printing, etc.

The object of such institutions is purely educational and in no case are classes considered workshops for the production of work and the work produced in training is considered the property of the students, a rule being enforced that the educational authorities can demand the use of it for advertisement purposes for one full year and tools are usually supplied free and students supplying the materials and they are allowed to engage in individual application to particular projects—a special course of study being mapped out, extending through various departments.

Fees ranging from Rs. 2 for a single subject to Rs. 75 for inclusive subject per quarter are charged. Many free studentships and scholarships to as high as Rs. 3,000 per annum are awarded to students upon the results of competitive examination. Note here that scholarships or Exhibitions are given to students who are already attending the classes and have shown exceptional ability and this to a certain extent prevents the abuse of such funds by students who would join to obtain the scholarship value only and is far better method than that of giving scholarship to induce students to fill the class only.

These institutions are under the management of a committee consisting of the principal gentlemen of the neighbourhood and they are called the "Governors". They meet at the end of every month to settle financial

and other matters. The principal and heads of each department attend this meeting.

A principal is placed in charge of the whole polytechnic and under him there is a special head of each department to whom the staff of each department is responsible, each head being allotted certain jurisdiction and initiative.

The funds are obtained from several sources :—

1. The endowed funds of the Institution.
2. Funds subscribed.
3. Grants from the L. C. Council.
4. Grants from Board of Education.
5. Fees.

These grants are awarded for the number and grade of students, the students being divided into various classes and so much paid per head for attendance and results.

Prizes and scholarships are abundantly offered to stimulate the efforts of the students.

1. Board of Education Scholarship, medals and prizes of books, materials and money.
2. London County Council Board of Education Scholarship, medals and prizes of books, materials and money.
3. Special prizes from His Majesty the King for special excellence.
4. Special scholarships from Their H. R. Hs. the Prince and Princess of Wales.
5. Special prizes and awards offered by private persons and societies ranging as high as Rs. 7,500 each.

The ramifications of such an educational institution are enormous and more upon the scale of a town. The juxtaposition of all departments of knowledge and the consequent mutual benefit of such an arrangement cannot be over-estimated, the latest expert knowledge upon any subject being ready to hand to assist in the expeditious completion of any projects whatever the subject.

This model of the polytechnic is being followed in India by such institutions as the Technological Institute, Bombay; Bengal Technical Institute, Calcutta; Technical Institute, Baroda, etc.

Some of the particular features in the Western theory of Education which seem to be somewhat neglected at present here are as follows :—

Hygiene,—the very strict attention paid to the science of health, the frequent medical inspection of all schools and students, the physical, dental, optical and mental efficiency record and the proper feeding of students, temperature of the class rooms which latter is not of so much importance here.

What is the advantage of a good education if the physical condition is too weak to enable one to use it to the fullest advantage? And the stated expectation of life of a Mysorean is twenty-five years gives no time for the application of any training. Physical degeneration produces pessimistic characteristics, irresponsibility, lack of vitality and energy.

With the rapidly increasing death rate and decreasing birth rate, this matter would appear to be of vital importance to the well-being of Mysoreans.

The State training of students who have already given proofs of unusual ability under an agreement that their services must be placed at the disposal of the State for a certain period after the completion of their training is necessary ;

ATHLETICS OR RECREATION PERIODS.

It is necessary for the development and health of the body to counteract all the ills attendant upon a sedentary occupation. Athletics can be considered to be any physical exercise causing oxygenation of the blood and producing energy and the re-creation of the power to study.

The great influence of memory training.—To any serious thinker it is obvious that the basis of all knowledge is the memory. The object of all training is to develop the power of the mind this being the primary source

or energy from which evolves the hand and eye craft of the artizan, the ideas, influence, knowledge and force of intellect of the expert in all professions. During training, therefore, the mind must be trained to the habit of concentration in order to create a permanent impression or record of the study in the memory. Knowledge which cannot be instantly recalled at will and which is not perfectly reliable in detail is only so much wasted education.

Study of one subject should not be continued for too long a period or the matter cannot be retained and herein lies the great value of athletics as a recreation of the freshness or power of the mind.

This necessary concentration or undivided attention greatly depends upon the method in which the lesson is placed, by the fascination of the teacher's introduction and explanation of the subject. The threat of corporal punishment in order to obtain their attention is of little or no value and quite unnecessary if the teacher has developed the ability to place his facts in an easy succession and interesting manner.

THE TEACHING STAFF.

This brings us to the teacher—the most vital factor in Education as with him lies the power to make or mar the whole organization. Western education authorities make very careful selection concerning the following particulars:—Training qualifications, morals, aims, initiative, knowledge of pedagogy, powers of discipline, and further make the condition that he must continue his personal studies during his appointment.

The teacher is the example of the highest efficiency which is placed before the students at their youthful ages. His methods of work, ideals, energies, habits, courtesy, morals, patriotism, in fact his entire conception of life is set as a standard before these young intellects with their passion to absorb knowledge and copy ideals. Therefore considering what a vast influence this man's character must have upon the whole

life of the student it is very advisable that we neither stint trouble nor expense in the selection of suitable models, for according to his standards the whole future generation in his charge will be moulded.

From a consideration of the community of trades, professions and prowess forming a nation it is very obvious that the central care of the whole is the industrial occupations of the people, for from the results of labour accrue all the produce or funds necessary for the continuance and organization of commerce, the many professions and the institutions of officialdom.

It is very necessary, therefore, that this basis of operations should have the most careful consideration; one of the most important factors influencing the production, wealth and health of the industrial population is the general state of education and the organization for the training of workmen upon sound and systematised principles.

Let us consider for a moment the various nations. The richest and most influential are those with the highest state of education. Their peoples are industrious, their commerce extensive, the stability of their banks and their business integrity acknowledged by the world. The greatest care is exercised concerning the general state of education which is free, often compulsory. Their literary statistics are exceedingly high. What can I say of Mysore in comparison? That there are other States far worse is worth little consideration and concerning our industrial education is it to our advantage that our teachers are often paid less than an expert workman? That no less than 30 per cent are entirely illiterate even in their own language and that more than 50 per cent cannot read the general text-books comprising the latest knowledge of all industrial subjects and further that they have no desire to learn cannot be matter for pride to us.

In the forward march of nations those who neglect their education are exploited by those who have the greater knowledge and

particularly so by unscrupulous nations working entirely for their own advantage.

Education alone, however freely spread, is insufficient to place a country in the foremost ranks of the world. Intellect without the necessary force of will power, can accomplish nothing. A strength of purpose that will acknowledge no defeat, a steadfast purpose that insists that no cause is lost until it is finally won, (obviously not the spirit of persistence that worries again and again in the same old way) is what we require, one that receiving check will reconsider the matter in all ways and if the cause is good and just will bring it forward again making fresh investigation in every possible direction, bringing fresh knowledge to bear from every source; a will power to which every present failure is but an added stimulation towards success. Such a spirit of enterprise fostered in a nation fears nothing and recognises no barriers. It will obtain its knowledge and means of progression whether you give it freely or withhold it. Without the stimulation of this victorious spirit all the wealth spent upon the distribution of knowledge is useless. The force of will power and a definite purpose in life is the prerogative of the human species—the essence of the absolute invisible energy of our eternal being. The animal has no definite purpose in life beyond the instincts of preservation and reproduction of species. This development of the strength of moral character, perseverance and self-reliance, responsibility, thoroughness and truthfulness is therefore one of the vital necessities of education.

Consider for a few minutes the years of persevering studies, in some cases one might say lifetimes, organizations necessary for the perfection in one subject for instance, the numbers of experiments and close observation of details necessary to produce a result like wireless telegraphy or the more recent invention of wireless telephony, the results by which a man speaking in London can be

heard in India without wires or any connection, and other great inventions or discoveries such as X-rays, Radium, Submarine wireless, Aeronautics, the recent optical investigations which will respond eyeglasses and the benefits to life usually from the researches of the Lister and Pasture Institutes and the vast advantages to humanity resulting from the persistent research and thought of a few men working with, a definite aim, untiring purpose and courage.

One of the greatest advantages of a polytechnic is the unlimited facilities and assistance it provides for scientific research in any subject.

“Scientific research” which has not become a byword is not restricted to the department of chemistry as many suppose but all departments of knowledge and can be defined as systematic or accurate investigations, the experience sought by the most exact scrutiny in search of true principles or the individual application of previous training to the personal life work of the student is the output of his initiative and intellect. It is of extreme value, not as a principal but an auxiliary to industrial evolution and can therefore be undertaken by all.

The value of such scientific research to a nation even in the event of as many as 90 per cent of failures is inestimable but to give some idea both of the possibilities and results arising from it we will consider some of the efforts upon the wealth of industry resulting in one department only—Chemistry—during the present generation.

From a casual inspection of the infinite varieties of matter of which this world consists, the innumerable botanical specimens, animal and insect organisms, the multitudinous mineral specimens, the powers and forces in the use of man, and the unending classifications of the products of industry or from the consideration of matter with as little apparent relation as a piece of pot stone, a charge of fulminate of mercury, a

sandal-wood carving, a butterfly's wing, a motor car or a dose of medicine, we should possibly hastily infer that all these are of separate and distinct composition.

But the results of careful scientific investigation teaches us that it is absolutely certain that all known substances, however far they seem to differ in constitution and in their interactions, are only different modes of matter, consisting primarily of a few simple elements and manipulated by universal forces into varieties of forms; these innumerable varieties of form, or assemblies of matter, are due to the fact that the forces which manipulate their transformations and the various conditions under which they were produced, being numberless. The resulting varieties could not but be multitudinous.

Chemical analysis has discovered that all these known bodies of which the world is comprised can be reduced to the category of about seventy simple elements, simple being the term applied to an element which no chemical analysis has been able so far to sub-divide or destroy, but it is now strongly suspected that this classification under seventy heads is merely temporary and the limitation caused by the present inadequacy of sufficiently subtle means of investigation. The latest theories assign to nature, a unity of matter, not as yet estimable by direct proofs, but strongly supported by philosophic hypothesis from the latest physical research. The natural molecules of which the world is composed, are a primary cosmic substance which in various regions and under differing conditions form into the solid bodies and are restored again to the great whole and from which it again issues, after its solid forms have decomposed.

However, the actual basis of matter does not now concern us, the present consideration is that everything is reducible to seventy simple elements; to reconstruct such matter, or if not the cellular tissues of the substances, at least the absolute essence of which they are constituted, is within the bounds of

possibility as a simpler, cheaper and more expeditious means of production of many of the world's necessities by a nation comprising the necessary skilled chemists or who will stimulate such scientific research.

Some idea of the value of such chemical research to a nation can be obtained from the following figures to quote an example seriously affecting India. The trade in the culture of the indigo plant was worth three million pounds a year to Indian finances. German scientists set themselves to produce synthetic indigo dye, and although it entailed twenty years of continuous research at the cost of one million pounds in experiments, in the end they succeeded and the trade of India was ruined and Germany's chemical production of indigo in 1900 replaced the products of nearly 400 square miles of indigo plantation in India. During the present war this indigo trade is being revived and nearly equals its former state. The pity is not so much that the indigo plantations suffered but that the education of another nation should have been allowed to get so far in advance.

Thirty years ago in England it was an accepted fact that a staff of experimental chemists was a necessary and valuable auxiliary to an industrial factory. Germany Firms had a total of 506 chemists and 350 engineers and other experts or one for every twenty workers.

In the production of coal gas many other products are obtained which fifty years ago were regarded as a nuisance and sold as waste at a few shillings a ton. From this waste chemical research has produced dyes, carbolic acid, picric acid, saccharine, scent toluol, and the greatest necessity of the present warfare, Trinitrotoluol and from these waste products in a few years have developed industries in dyes alone to the enormous extent of using 6,000 men, 4,000 gallon of water, and work covering 500 acres, $\frac{1}{4}$ million tons of coal, 4,000 million gallons of waste and 400 million cubic feet of gas with 250 engines.

The English textile trade which also depends upon dye-stuff, being £200,000,000 value annually and upon which $1\frac{1}{2}$ millions of people are employed.

A hundred years ago 75 per cent of the general population was occupied with

agricultural pursuits but by educational enterprise and Government assistance they gradually withdrew these, importing workmen from the surrounding countries till only 30 per cent continued with occupation upon the land and it must be remembered that during fifty years Germany added 24,000,000 to her population and France whose population was a million in excess previously was placed 20,000,000 less. By scientific research, and industrial stimulation raw materials were imported and manufactured into highly valued products and again exported; by these advanced scientific knowledge, co-operation and careful organized business propagation they manufactured and sold products necessary to other countries and which they themselves could not produce and within ten years, 1903-1913, their forcing in trade rose from £542 millions to £1,021 millions; their trade with Britain alone amounts to £80,400,000; to most countries their export trade was double the imports and to Austria it was multiplied as much as six times the trade they received and thus they were becoming fabulously wealthy and in their egotism and newly acquired power they set out to conquer and rule the entire world but failed through their unscrupulous disregard for the rights of nations and want of moral character. This matter is however beside the present question.

These few examples should be sufficient to show the value of scientific enterprise in industry and the necessity of obtaining sufficient training to use the raw material and waste products of the country instead of allowing others to prosper upon our wealth of natural and other resources.

Other countries have already recognised the vital importance of a sound education, the value of knowledge backed up by energy and initiative and the extreme consequence of scientific research not as a principal but an auxiliary to industrial evolution and the training of experts by specialised courses.

It is very advisable to make every effort, during this present period of changing markets and raising prices, to avail ourselves of the great opportunity for the evolution of our industrial resources and with this aim in view what institution can offer equal training facilities with the polytechnics and combined departments and the stimulation of educational progress offered by the easy access to export knowledge in all subjects?

ECONOMICS IN THE WEST.

India's Economic Position.

London, 28th March, 1918.—India's economic position to-day is so largely based upon British methods and British achievements that more than ordinary interest attaches to the paper read at the Society of Arts a fortnight since on "English Commerce with India 1608-1658" by Mr. William Foster, C.I.E., Registrar and Keeper of the Records at the India Office. Mr. Foster is perhaps our greatest living authority on the beginnings of English history in India. He has edited with consummate skill the earlier series of Indian Records and the numerous volumes embodying the fruits of his work are amongst the most valuable works of the kind extant—a mine of information to the literary student and a veritable treasure house for those who seek knowledge on any of the special activities of the East India Company in the first decades of its existence. From such an authority a thoroughly informed survey of the field of commercial effort in India three centuries ago was to be looked for and it was not sought in vain. Mr. Foster handled his subject with discriminating skill and the result is a monograph which deserves to be read in its entirety by all who are concerned with the industrial welfare of India. Necessarily the paper touched only the fringes of the vast subject of Indian trade in those remote days when the Mogul power was firmly seated in Northern India. Nevertheless, it contains much which throws light upon modern problems and as a whole brings out the essential greatness of India as a manufacturing and commercial centre.

THE INDIGO INDUSTRY.

An interesting portion of Mr. Foster's paper was that in which he dealt with the Indigo trade. Recent events have brought this industry into great prominence and we

have seen within the past few years a revival of the demand for the product which has led to something like a boom in the Stock Market in the shares of Indigo concerns which are now largely financed with European capital. But Mr. Foster showed that three hundred years ago Indigo was a staple Indian mercantile commodity and that the East India Company was an eager trader in the article whose value was then beginning to be appreciated in England for dyeing purposes as a substitute for the wood and log wood which up to the end of the sixteenth century had been very largely employed in the manipulation of the woollen cloths for which England was famous. Indigo, it seems, was originally introduced into England from the Levant and from France and other Continental countries. The first use made of it proved so successful that in 1582 instructions were given to a traveller to endeavour to procure seeds or plants in Egypt with a view to indigo being acclimatised in England. What came of this commission we do not know, but an indication of the growing importance of the commodity in the subsequent years is to be found in the fact that in 1615 the Company's ship "The Merchants' Hope" took home from Surat over 1,400 bales of Indigo procured chiefly at Ahmedabad, thereafter became the principal constituent of the cargoes sent home from Western India. The chief centres of supply, Mr. Foster states, were Sarkhej near Ahmedabad, and Biana near Agra. The methods of manufacture in these districts were different, the result being, in the case of the former a coarse kind of indigo, often much adulterated, while the Biana variety was hard and of a superior quality. The distinction was known in London some years before the arrival of the "Hope," for in April, 1609, we find the East India Company writing that Sarkheg indigo was then worth 5s a pound, while the Lahore kind (by which they meant the Biana indigo which then

came overland, mostly from Lahore) was fetching 8s. When once the importation had been established these prices dropped to about 5s. 6d. or 6s. for the Biana variety and 4s. or 4s. 6d. for that from Sarkhej..... Besides these two kinds we hear of a medium quality obtained from Sind from about 1638 onwards; in 1646 this was fetching 3s. 4d. a pound and two years later 2s. 8d. Some Indigo received from the Coromandel Coast sold in 1644 and 1645 for a little over 1s. 3d. and in 1657 for 1s. 5½d. It was evidently of a very inferior quality." The success of the Indigo importations led to an attempt in England to utilise indigo dust (bought at a cheap rate from the Company) by working it up into an imitation of the ordinary balls or cakes. In July 1634 William Bolton obtained a patent for this process, much to the indignation of the Company whose remonstrances were so vigorous that in the following December the patent was cancelled. The average price paid in India for indigo was only 1s. per pound so that the Company's alarm at the infringement of its monopoly can be well understood. Nor was it alone the home market that the Company had in view in their protective policy. They re-exported the indigo brought home in their ships to the continent, much of it going to the Mediterranean for sale in Southern France and Italy, while a quantity found a market at Hamburg, Danzig and even in Holland, though the Dutch were, of course, bringing their own supplies from India. Eventually the Company's trade was threatened with competition from the West Indies and so fierce did this become in course of years that during the latter part of the seventeenth and the earlier part of the eighteenth centuries the importation from India was limited to the better qualities grown in the Agra neighbourhood and purchased at Surat. The anarchy that ensued upon the death of Aurangzeb doubtless restricted the supply and enhanced the cost; and after the year 1724 the Company omitted indigo from

the annual list of commodities to be purchased. About the middle of the eighteenth century the abandonment of the cultivation of indigo in the West India Islands left the market to the Americans and the Spaniards and when both sources of supply were stopped in 1775 by the War of Independence there was a revived demand for the Indian commodity. This led to the establishment about 1779 under the Company's auspices of a flourishing indigo industry in Bengal which to-day is one of the great economic assets of India. So does the whirligig of time bring its changes.

THE CALICO TRADE.

The calico trade is another subject upon which Mr. Foster turned an interesting light. He showed how at the time of the Company's foundation there was little or no demand for cotton goods in England the ground being occupied by linens imported from France, the Netherlands, and Germany. But when the Turkey Company began to import cotton goods from the Levant the demand for the goods speedily spread and the East India Company, with the business-like acumen which distinguished it, took up the trade and widely extended the vogue for the products of the Indian looms that in 1630 the Company was ordering from Surat 100,000 to 120,000 pieces of white calico alone. The great famine of 1630-32 ruined the trade for a time, but in after years it revived and there was soon in addition to an importation of Sind-made goods a brisk trade done in piecegoods from the Coromandal Coast, which found favour in France and other Continental countries. Mr. Foster had some interesting remarks on the manner in which the efforts of the Company to secure uniformity in length and quality were balked by the conservatism of the Indian weavers. At the beginning of 1628 the Surat factors wrote that they had tried in vain to secure the more substantial making of the cloth. The weavers objected on the score that more yarn would be used, while the price of the

finished article would not increase in proportion, adding that they could sell all they made in their usual fashion to other buyers if the English did not want them. Some twenty years later the Company demanded cloths of special lengths and breadths, but again the makers demurred pointing out that such goods would not easily find a market elsewhere if rejected for any defect. Numerous complaints from London show that the calicoes provided varied considerably in size and in quality, while no improvement could be secured because the demand in India from other and less fastidious quarters was sufficiently great to warrant the producers in refusing to alter their traditional methods. Interesting as were these and other facts which Mr. Foster gave they would not have been complete without the speech made in the discussion which followed the reading of the paper by a gentleman interested in the Manchester trade. This speaker showed that it was India that taught Manchester her business in many respects—notably in the matter of cotton printing—and he cited instances in which the Manchester goods of to-day are known in the trade by Indian names representing older Indian goods of the same type.

PRODUCTION OF ISINGLASS.

Here is a note on Isinglass which may prove suggestive in these days of economic development in India. The information contained in it is taken from a pamphlet (Tract No. 29) I came across the other day when conducting some researches at the India Office. The title of the brochure is "Production of Isinglass on the Coasts of India," and the author was Dr. J. Forbes Royle the well-known authority on Indian economic products. The author, who wrote in 1842, states that Isinglass is the purest known form of animal jelly and is obtained from the swimming bladder of a few kinds of fish chiefly of the genus Sturgeon, the Acipenser of Zoologists. At one time nearly all the Isinglass imported into England came from

Russia, but Dr. Forbes Royle states that the product is not confined to the tribe of Sturgeons, nor to the rivers of Russia, but is found in fishes on the warm coast of Brazil and the cold one of Iceland. "It would, therefore, not be surprising," he went on to say, "to find it yielded by some of the great variety of shoals of fishes on the long extended coasts of India. Some experimental quantities have, in fact, already been imported from Bengal into England within the last year. Indeed, it will appear that a trade in Isinglass and some of its substitutes has long been established on the coasts of India." Dr. Forbes Royle went on to say that the first who appeared to have drawn attention to the subject was an anonymous correspondent in Parbary's *Oriental Herald* in June, 1839, who stated that the Chinese had long been engaged in a trade with Calcutta in Isinglass, also that the product was obtained from a fish called *Sulleah* in Bengal and that from a half pound to three-quarters a pound was obtained from each fish. In consequence of this notice Mr. Mc Clelland of the Bengal Medical Service turned attention to the subject and he had, the writer said, pursued it with a degree of energy and intelligence which rendered it extremely probable. That Isinglass might be regularly established as an article of export from Bengal to Europe, Mr. Mc Clelland ascertained that the species affording the Isinglass was the *Polynemus Sele* of Buchanan, *Sele* or *Sulea* of the Bengalese, described in his work on Gange-tic fishes. Isinglass, however, was obtained from other genera. Finally Dr. Forbes Royle stated that in early days Isinglass was unknown to Europeans but had been exported from India by the Chinese from time immemorial.

MARGARINE INDUSTRY.

In our rational condition we are all paying a special degree of attention to the sources of the food supply. One commodity which is literally on everyone's life or would be, if supplies were adequate, is margarine which in default of butter is the companion of our daily

bread. Now margarine, as every school boy knows in these days, is largely compounded of vegetable fat extracted from cocoanuts and oil palms and other tropical growths. Before the war Germany had a grip on this industry as she had on every other and the curious spectacle was furnished of great fleets of British ships taking from British ports to Hamburg, Antwerp and Rotterdam cargoes of copra which latter was manufactured into margarine for British consumption. That condition of affairs we may hope and believe is a thing of the past. Vast quantities of margarine are being turned out in British manufactures and the supply from Holland is drying up if it has not actually ceased. When the war is over we shall probably have a well equipped up-to-date margarine industry capable of absorbing all supplies of copra and palm oil produced within the Empire. This circumstance emphasises the importance of increased attention to the production of cocoanuts. Beyond doubt a great future exists for this branch of tropical agriculture and wherever possible means should be adopted to develop it on scientific lines. An article in the Trade Supplement of the *Times* emphasises the importance of manuring. It shows that under a system of high cultivation 250 nuts have been produced where only from 35 to 50 had been furnished previously. The writer enters into elaborate calculations to show how enormously profitable coconut cultivation may be made. His facts will be no news to many in the East who have long been aware of the high value of the coconut palm as a revenue producer. For example, when I was in Ceylon about ten years ago I was assured on good authority that it was the custom of wealthy Singhalese on the birth of a daughter to plant five acres with cocoanuts to provide a dowry for her. So successful was the venture in most instances that when the young lady was of marriageable age she was so wealthy as to have no lack of suitors. India's interest in this question is, perhaps, not so great as that of some countries where the climatic conditions are more favourable to the palm. Nevertheless along a vast expanse of her coast the coconut thrives sufficiently well to make it expedient for her to take serious note of this modern tendency to turn vegetable fat to account for food production.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

By-products From Cement Mills.

Washington, D.C., U.S.A., 2nd April, 1918.—Cement as a by-product seems to be quite within the possibilities, in a good many instances, as the result of potash-recovery systems being installed in cement mills. The latest instance of a successful recovery system is reported by a large New York concern which is erecting a large potash-recovery plant, where the dust from 2,000 barrels of cement will be handled daily.

Potash salts to the amount of one million tons a year, and to the value of about eighteen million dollars were used in this country yearly before the war. The elimination of German potash, of course, sent the stimulated new methods of price soaring and recovery in this country, made commercially possible by the high prices, but even so it is estimated that not more than eight per cent of the nation's requirements were supplied in the last twelve months.

When it was ascertained that the escaping dust from Portland cement plants carried a fair percentage of potash, experiments were undertaken by a large western establishment, licensees of the Cottrell process, of electrical precipitation for its recovery. After many experiments the method has been perfected; and a year's trial under practical operation has resulted in having a greater income from potash than from cement; or, from another point of view, the cement has now become the by-product, and the owners find themselves from one year's operation with the entire cost of their plant returned to them together with a profit. Operating costs show that the process will be profitable at pre-war prices. The United States Department of Agriculture estimates that more than one-third of the country's requirements can be

obtained from the now-wasted dust of cement plants.

EXPLORING THE INSIDE OF AN AUTOMOBILE TIRE.

It has always been a rather awkward matter to get at the inner tube of a tire to locate and repair a break—that is, by any method short of actually disassembling the whole tire and dragging its internals out into broad daylight. An inventor of the middle west, however, has now put out a device which bids fair to change the whole complexion of things in the tire-repair shop. This is an ingenious little pair of mechanical fingers which are inserted into the beading, and which distend the opening between the two edges to three or four times its natural size. Then we have, under these fingers, a group of small rollers. When these are rotated the whole tire moves slowly about, the spreader sliding about inside as the rollers roll on the outside; and the apparatus is cleverly arranged so that the rollers support the weight of the tire under this treatment and take up any strains to which the fabric would otherwise be subjected by the operation. Of course, the rollers and the fingers are so adjusted that the harder the fingers pry in their search for the concealed vitals of the tire, the more the rollers yield under the pressure and gradually back away into their housing.

The idea of all this is, of course, to find the damaged spot without crawling into the outer tube or removing the inner one completely. But this is not all that is to be done. Once the offending region is exposed to view, a buffing plate takes the place of the spreader fingers, and affords a solid background against which adequate buffing is so easy that the whole area around the hole is transformed into smooth surface of clean rubber in less time than it takes to tell the *modus operandi*.

AN ADJUSTABLE CURVE.

A most ingenious drawing instrument for making curves has recently been patented by

a New England draughtsman. This interesting device consists of a bow, a flexible rule pivoted at the ends to the ends of a bow and having a pair of inwardly-extending studs, a flat reinforcement spring contacting with the inner side of the rule and having slots receiving the studs, and a screw-threaded adjusting device extending between the centre of the spring and the bow. By adjusting the screw threaded member the curve may be changed to meet all requirements within the range of the instrument. Perhaps the greatest application of this device will be in laying out parabolas of varying sizes.

WONDERFUL PROGRESS OF THE AUTOMOBILE.

It is twenty-two years ago, almost to a day, that the first sale of an automobile was made in this country. In this, as well as in experimental progress, Europe, particularly France, the birthplace of the gasoline car, was at that time a year or so ahead of the United States. To-day, out of about five and one-half millions of automobiles of all types in use throughout the world, four and a quarter million, or 77 per cent, are within the borders of the United States--one to every twenty-four of our population, one to every fifth family. This service, largely utilitarian, is now warp and woof of our national existence, commercial and social, interwoven into every sphere of our varied activities. And in these twenty-two years the industry which produces the automobile has grown from nothing to the third largest in the country, ranking next to steel and railroads. It employs, in the automobile factories proper and in accessories and parts manufacturing, a total of 600,000 workers. With a capitalization of \$736,000,000, the automobile makers do an annual gross business of \$917,470,928. About 28,000 dealer units are engaged in marketing the products of the automobile factories, representing a further capitalization of approximately \$184,000,000 and the employment of an additional 230,000 wage earners. Then there is the tire-manufactur-

ing business, which produces eighteen million tires annually, worth \$450,000,000. On the basis established by the government census bureau, of four and a half adults and children in the average American family, nearly five per cent of the population of the United States is now dependent on the automobile industry for its living.

Measured in terms of service rendered, 4,000,000 passenger cars averaging 5,000 miles a year and three passengers each, give a total of 60,000,000,000 passenger miles. At two cents per mile this service is worth \$1,100,000,000 annually. The figures for railroads are 35,000,000,000 passenger miles, worth \$700,000,000. In 1916 the electric traction roads carried 12,135,000,000 passengers, and the average of three-mile ride--no experts place a higher figure--would give a passenger mile service to that of the railroads. No one questions the continuance of the growth of railroads and electric traction lines, or an ever-increasing extension of their valuable services. Then how can any one question a continuance in growth of motor travel, now almost equal to railroad and traction travel combined?

SENDING THE MAILS THROUGH THE AIR.

Since 1908, when Orville Wright first demonstrated to an incredulous world that a heavier-than-air contrivance of canvas, wood and gasoline engine could actually fly, enthusiasts over the new art have kept alive the hope that some day the power of the nation would be officially directed to the development of aviation. That day came, not when Congress appropriated \$640,000,000 for battle planes and aviators for foreign service, but when the war developed aviation sufficiently to enable professional aeronauts and manufacturers to assure the postmaster-general that an aerial mail route was far from being an impossibility.

It is now about to become a fact. A daily mail service between New York City,

Philadelphia and Washington is to be established as soon as the postal authorities can get machines built under bids or obtain them from the War Department—which method will be used has not yet been definitely decided.

It appears that the difficulties in the way are no longer those bound up in engine, plane, strut or fuel—that neither distance, air current, prevailing wind nor landing ground offer insuperable difficulties. The lions in the path of him who would fly with a mail sack from capital to metropolis are meteorological beasts, and until they have been met and slain no man may say whether or not the service will be a success. With all else provided in perfection, there yet remains the matter of fog.

Imponderable in itself, it may be the one bar to the successful establishment of the aerial mail service. An airplane which cannot find its landing grounds is the most helpless thing imaginable. It can stay aloft only so long as its fuel holds out, after which it must come down. If it can find no proper place to land disaster is the inevitable end of the flight. Whether mail planes can find their landing places in the winter fogs which so frequently encompass and enwrap New York harbor is something which only the first fog and the first aviator to test it can say.

With ample funds, appropriated by Congress for the purpose, the post-office department begins the establishment of a mail service *via* plane with every prospect of success in every way except the one unknown factor of weather. It is pointed out that no service which is occasional or intermittent will be regarded as satisfactory or adopted by the postal authorities.

Airplane mail will be decidedly more expensive to send than ordinary mail, and those who use it will have to pay 24 cents an ounce for the privilege in addition to the regular postage of three cents, although it is possible that there may be a change in this

rate after some months' experience have demonstrated the exact cost of the service. The post-office will not be willing to make a high charge for the privilege of sending mail from city to city in a few hours and then not "make good" on the delivery.

RADIUM FROM CARNOTITE ORE.

The largest deposits of uranium-bearing ore in the world are situated in south western Colorado and eastern Utah. In order to demonstrate the value of these deposits the United States bureau of mines made an arrangement with the National Radium Institute whereby the government was able to experiment on the treatment of carnotite ore, and incidentally to retain in this country a supply of radium for the use of two of our most important hospitals. During the period from 1914 to 1916 more than eight grammes of radium were obtained at a cost of less than \$40,000 per gramme. This was turned over to the General Memorial Hospital, in New York, and to the Howard A. Kelley Hospital, in Baltimore. This amount is more than seven times as much as the total amount owned and in use in the United States before the work began. Meanwhile, all the details for the treatment of carnotite ore were worked out and published for the benefit of the world at large. The United States Government radium plant was operated until January, 1917. The bureau of mines has retained enough of the output to enable it to carry out a number of important scientific investigations in connection with radium.

SAFETY BRAKE FOR ELECTRIC TOOLS.

In order that they may be capable of coping with the heaviest kind of work electric tools are generally provided with the most powerful kind of motors. As long as the work is satisfactory no trouble is experienced; but once the bit or drill sticks or binds the powerful motor immediately causes the entire tool to revolve with oftentimes serious injury to the user. In order to overcome this danger a new safety brake has recently

been introduced, and is proving a success. This brake is composed of a special switch and connections including a small resistance. Its purpose is to shut off automatically the current and at the same time throw in the resistance in order to cause a powerful magnetic braking effect. When, for any reason, the operator's hand is removed from the handle the brake stops the revolving tool in less than one revolution, thus rendering it harmless. The tool cannot become unmanageable, as immediately upon the release of the switch, either by the operator letting it go or the handle being jerked out of his hands, the device shuts off the current and stops the tool.

WHAT THE MOTOR TRUCK CAN DO.

A notable example of what a motor truck can do in long-distance transportation is the fleet a big rubber house has been operating for the past six months between Akron, Ohio, and Boston, Massachusetts, a distance of 740 miles by the route they have followed. These trucks are operated on a strict time schedule, and even during the severe weather and bad road conditions of the past winter no serious delays have occurred. Some of this immunity from delay must be attributed to the fact that over a particularly difficult portion of the route (across the mountains of Pennsylvania) the local authorities kept the roads open for the benefit of the Government trucks that have been operating between Cleveland and the coast; but on the whole the experiment has demonstrated the entire feasibility of motor transportation over long distances and almost any kinds of roads. The experience of this fleet will be of great value to all users of trucks everywhere, not only in this country, but throughout the world. One of the important points developed is the desirability of equipping trucks intended for long distance work with a greater power ratio than is required for ordinary local work. The experiment also calls attention anew to

the urgent need for general highway improvement everywhere.

PUTTING OUT FIRES BEFORE THEY STARTED.

Promptness on the part of employees of the Pennsylvania Rail-road system in extinguishing fires before the arrival of the public fire companies last year saved \$10,445,196 worth of company property from destruction. Altogether 334 fires were put out by employees without outside aid. These occurred on property valued at \$10,457,774, but the total loss sustained was only \$12,575.

This illustrates clearly the value of thoroughly training employees in fire-fighting methods, or organizing fire brigades, and of providing modern fire-extinguishing apparatus at many points. The regularly organized fire brigades, chemical extinguishers, locomotive fire apparatus, water casks and fire pails, fire hose, high pressure lines, chemical engines, sand pails, extinguishers and tug boats were utilized in one place or another in putting out these fires. Moreover, by following the general instructions given in fire-fighting methods, employees of the company extinguished 107 fires without the aid of any apparatus at all, for a total loss of \$2,064, on property valued at \$355,590.

ALFRED T. MARKS.

In addition to the 3,500 tractors placed at the disposal of agriculturists during the past year, the British Food Production Department has supplied county committees with over 2,500 cultivators, pressers, and trailer boxes for use with the tractors. Moreover, the Department has consigned to committees about 14,000 horse-drawn implements, including 4,800 ploughs, 2,800 harrows and drags, 2,300 rollers and pressers, 1,200 drills, 780 disc harrows, 1,400 cultivators, and 1,300 carts and lorries.

NOTES.

Messrs. Samuel Montagu and Co., in their weekly bullion letter, say:—The expression "precious metal" has been commonly used to imply a reference to either gold or silver. To-day the range is wider, for several other metals have acquired commercial values far exceeding those of gold and silver. It is reported, for instance, that the United States Government has just commandeered the stocks of platinum, palladium and iridium in that country, and has fixed the respective prices at the dollar equivalents of £21, £27, and £35 per troy ounce. On these bases the prices for platinum is twenty-fold, for palladium, ten-fold, and for iridium thirty-fold that which once obtained. These high quotations, however, seem insignificant beside that for radium, which, at £16 per milligramme, works out at £500,000 per troy ounce.

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As a result of the shortage of mineral oil in the United Kingdom, the demand for castor oil has considerably increased at the present time. The Government of Madras has, with a view to increase the supply, arranged to give to "ryots" seed at a quarter of the cost price, to remit assessment in the case of the failure of a crop, to throw open waste lands for cultivation of this crop, and to provide other facilities for ryots for encouraging the growing castor in all available places. The Railway Board have drawn the attention of the railway administrations in India to the desirability of growing castor seed along the railway line wherever possible and the Eastern Bengal State Railway has already taken the matter up. Mr. H. C. Sampson, Deputy Director of Agriculture, Coimbatore Circle, considers that castor could successfully be grown in all districts except the West Coast.

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Mr. Walter Long, in a speech in London, announced last month that the War Cabinet approved a scheme of Imperial preference formulated by the Committee of the Cabinet which was considering the question of inter-Imperial trade. Mr. Walter Long said he believed the whole Empire would approve the scheme. The Committee had dealt with

the question of securing raw materials for the Empire in the first instance, and a whole series of reports on the matter had been approved by the War Conference and War Cabinet. The Government was losing no time in seeing to it that the Allies' victory should be a real victory, not only giving peace to the world, but giving a lead which other countries would gladly follow, and which would enable us to develop the Empire along lines leading to prosperity for ourselves and for our co-operators.

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The *Agricultural News*, published by the Imperial Department of Agriculture for the West Indies, states that some years ago the Commissioner of Agriculture gave attention to the question of preparing coloring matter from annatto seeds and discovered a simple process for the purpose. He found that the coloring matter is easily removed from annatto seeds by washing them in a dilute solution of ammonium hydrate. The solution is strained off from the seeds and evaporated to a thick paste in steam heated pans, when it yields an annatto paste of greater brilliancy than that obtained in the usual way. The great simplicity of this process would permit of its being carried out in places where annatto is grown, so that the concentrated paste might be shipped instead of the somewhat bulky seeds. Because of the shortage of dyestuffs, the Commissioner recently brought this matter to the notice of the Colonial Office, suggesting that it might be well to submit the idea to the Inventions Board as of possible use at the present moment. The Department of Scientific and Industrial Research was consulted, and it has reported that annatto is now chiefly used for coloring butter and cheese and only to a very small and unimportant extent in dyeing. Annatto is not grown to any extent in the West Indies, except perhaps in Jamaica, which still produces a small quantity. Should there be any future for this dye, and the cultivation of the plant extended, it would be an easy matter to carry out the process suggested, as a factory for the purpose would be a simple affair. After the dye is extracted seeds might possibly be used for oil production and as cattle food.

GLEANINGS.

According to reliable information, agricultural engineering firms in France are making great efforts to extend their production of agricultural machinery and implements, and most of them are enlarging their factories with a view to meeting the increasingly heavy demand which, apparently, is not only from France, but also from other countries, especially from the East. A new company has quite recently been formed under the title of the Société Lyonnaise de Construction de Machines Agricoles, with a capital of 4,000,000 francs. This will be by far the largest agricultural engineering concern in the country. It has been founded by a powerful group which intends to carry on the manufacture of agricultural requisites on a very large scale. Similar preparations to extend the production of agricultural and other machinery, in response to a great demand from all quarters, are in progress also in other Allied and friendly countries, and British manufacturers should take note of it.

To the question "Will Government be pleased to consider the advisability of appointing Trade Commissioners in Japan and in the United States?", asked by the Hon'ble Sir Fazulbhoy Currimbhoy, the Hon'ble Sir George Barnes replied in the Imperial Legislative Council that the Government of India would prefer to await experience of the working of the Indian Trade Commissionership in London before considering the extension of our Commercial Intelligence organization to other countries. The suggestion which the Hon'ble Member has made will not, however, be lost on the Government, and it is one which is likely to receive serious consideration as our manufacturing industries and exports of manufactured product develop. In answer

to a further question asked by the same Hon'ble Member in regard to the re-organization of the Consular Services, Sir George Barnes replied that Indian Commercial Attaches would be appointed at some of the principal new markets where Indian goods could be sold.

In view of the success which has attended the paper making trials carried out at the Imperial Institute with South African "spent" wattle bark (the residue left after use of the bark as a tanning material), steps are being taken to test the value of Australian wattle bark for the same purpose. The "spent" bark from the Black Wattle of South Africa yields a good quality of brown paper. The Institute has asked for large samples of Australian bark for trial, and if these prove suitable an important addition will be made to the raw materials available for the manufacture of paper in Australia. Already, as a result of the investigations conducted at the Imperial Institute, a number of paper mills in the United Kingdom have been utilising considerable quantities of "spent" wattle bark of South African origin.

What is a School Garden?—A little experiment station which serves the following purposes:—

1. To illustrate lessons in elementary agriculture taught in the school.
2. To correct wrong notions existing in the district convincingly in a practical way.
3. To train hand and eye, encourage the formation of habits of neatness and tidiness and establish a relationship between other branches of school education such as Arithmetic, Drawing and Book-keeping and Agriculture.

ECONOMIC NOTES.

INDUSTRIES AND COMMERCE.

Sugar Supply of the World.

The following article is taken from the current number of the *International Sugar Journal* :—

A lengthy survey of the sugar situation was prepared in December by Mr. Herbert Hoover, the United States Food Administrator, to place before the investigating sub-committee of the Senate Committee on manufactures who were going into the question of the supply and cost of food to the consumer. This sub-committee took the unusual step of refusing to put the document officially on record: but the Committee on Public Information issued it for publication at President Wilson's instigation. We give below the chief features of this survey.

Mr. Hoover pointed out that for purpose of understanding the world sugar situation four factors had to be borne in mind; 1. The United States, Canada, and the United Kingdom were importing countries before the war, while France and Italy were very nearly self-supporting. 2. The main sources of supplies to importing countries were: (a) Germany and neighbouring Power; (b) the West Indies; and (c) the East Indies.

The German sources have been cut off entirely and Germany also largely absorbs the sugar of surrounding countries at the present time. Before the war England drew approximately 1,400,000 long tons per annum from German and neighbouring sources. France produced about 750,000 long tons of beet sugar and exported 50,000 tons. The French production in 1917 fell to 210,000 long tons. Italy produced about 210,000 long tons and imported almost none. The Italian production fell to 75,000 long tons.

Thus these three countries were thrown on to West and East Indian sources for 1,925,000 tons to maintain normal consumption—or to reduce this by home economic. The East Indian sugar requires about three times the length of voyage and, therefore, three times the amount of tonnage to bring it from that source compared to the West Indies. The actual draft of sugar from the Western Hemisphere by the Allies was 1,420,000 tons, against 300,000 tons pre-war normal. They also drew some 400,000 tons from Java and the East Indies.

The steady shortening of shipping throughout the

year thrust an increasing drain on the West Indies. Aside from this constant element of uncertainty in the position from month to month, another uncertain factor arose in that we could not judge the effect of their conservation measures in Europe. While drastic on the civil population, the consumption of soldiers is far above normal.

One of the first steps taken by the Food Administration after its appointment last August was to conserve the already limited sugar supplies by preventing sugar from being exported save to the Allies, and the Cuban Government followed suit as regards its own exports. In the meantime the Food Administration made every effort to secure voluntary reduction in sugar consumption by means of widespread propaganda in order that they might afford as large supplies to the Allies as possible. France's demands even on the low per capita consumption of 0.5kg. per month, came to 100,000 tons, and between August and November 82,319 tons were shipped to her, while during the same period the British requisition amounted to some 28,000 tons. Simultaneously the Cuban exports of the Allies amounted to 23,777 tons of raws.

After going into detailed statistics as to sugar during the last three years, the incidence of the consumption, and the supplies of sugar received and disbursed during the Autumn in the States, Mr. Hoover went on to declare that his conclusion was that "the conflicting operation of the war declaration run on the sugar bank and the conservation measures have more or less neutralized each other, that the drain of the Allies on Cuban and American supplies denuded us of a margin of about 300,000 tons that we needed to maintain normal consumption, instead of about 70 to 80 per cent during the last three months of the year; that this shortage has been accentuated by the lack of cars to move Louisiana and beet sugar promptly to areas of greater pressure; that there is not to-day, nor has there been, any supplies available which have not been brought into distribution.

"There has been a constant administrative difficulty from month to month in being unable to forecast the allied shipping position and the results from their reduced consumption and consequently of their needs.

"Such statements that there have been or will be ample supplies of sugar available are not only wrong and opposed to every fact in the situation but if they are believed and acted upon by the American public will have done this country's war efforts incalculable harm. It is our stern duty to feed the Allies, to maintain their health and strength at and cost to ourselves. There has not been, nor will be as we

see it, enough sugar for even their present meagre and depressing ration unless they send ships to remote markets for it. If we in our greed and gluttony force them either to further reduce their ration or to send these ships we will have done damage to our abilities to win this war.

"To-day the number of soldiers we can send to France is limited by the ships we have available. If we send the ships to Java for 250,000 tons of sugar next year to piece out their ration we will have necessitated employment of the equivalent of eleven extra ships for one year. This in our present situation is the measure of transport and maintenance of 150,000 to 200,000 men in France.

"In order to protect the public from profiteering and speculation, to protect it from 25 per cent sugar in the face of a short supply, every element of the sugar producing and sugar distribution in the country was called into conference and asked to voluntarily enter into an undertaking with the Administration to prevent these things. There are many interests to consider. The cane producers of Louisiana, the beet producers, the beet manufacturers, the Hawaiian cane producers, the cane refiners, the Cuban producers, the Allies' necessities, the American consumer. These conflicting interests have much accumulation of hatred and bitterness. It has been necessary to organize these groups upon a voluntary basis and to drive this team to the common good.

"The price of refined sugar to the consumer rose suddenly in August from $8\frac{1}{2}$ to $10\frac{1}{2}$ and 11 cents per pound. As a result of measures taken it has been reduced in the territory north and west of the Ohio and Mississippi to 8 and $8\frac{1}{2}$ cents, or a reduction of from $1\frac{1}{2}$ to 2 cents per pound, and in the South and Atlantic seaboard State to $9\frac{1}{2}$ cents, or a reduction of about 1 cent per pound. The price of sugar rose from 10 cents to 30 cents during the Civil War, when there was no restraint."

Mr. Hoover next outlined the steps the Food Administration took to keep down the price of sugar. These included: The suspension of the speculation of futures on the sugar market; the fixing of the price of beet sugar at 7.25 cents; and that of Louisiana at 7.80 cents for granulated; the fixing of a maximum of 6.90 duty paid at New York for imported raw sugars; regulations limiting the profits of refiners, wholesalers, and dealers; and wide spread propaganda amongst the public as to the prices they ought to pay. All these measures have resulted in maintaining a price of from $8\frac{1}{2}$ to 9 cents per lb. for granulated, retail.

Since September on Cuban raws have been diverted, as had been alleged. All went to the United

States or to the Allies, save some existing small contracts amounting to less than 2,000 tons.

The pre-war refiners' differential had amounted on the average to about 85 cents but as increased costs were found to have been imposed by the war-increased cost of refining, of losses, of bags, labour, insurance, interest, and other things, the margin was fixed at 1.30 per 100 lbs.

With a view to more efficient organization of the trade in imported sugars next year two committees, said Mr. Hoover, have been formed:—

1. A committee comprising representatives of all the elements of American canerefining groups. The principal duty of the committee is to divide the sugar imports pro rata to their various capacities and see that absolute justice is done to every refiner.

2. A committee comprising three representatives of the English, French and Italian Governments, two representatives of the American refiners, and a member of the Food Administration. Only two of the committee have arrived from Europe but they represent the allied Governments. The duties of this committee are to determine the most economical sources from a transport point of view of all the Allies, to arrange transport at uniform rates, to distribute the foreign sugar between the United States and Allies, subject to the approval of the American, English, French, and Italian Governments.

Dealing with the decision to pay 4.60 per 100 lbs. for Cubans this season, Mr. Hoover referred to appeals made to prejudice against the Food Administration for fixing that price so high as it was; it was said in effect that as they had the Cubans at their mercy they should get the sugar 1 cent a pound lower. But they had no wish to stifle production in Cuba just at the time of all times when the utmost production was needed and they had satisfied themselves after an exhaustive study of the cost of production in Cuba that the price fixed on was but little higher than the price at which the best factories in Cuba could produce, and it was bare justice Cubans to allow them a reasonable profit.

Mr. Hoover concluded his survey by repeating that if the American public would reduce their consumption of sugar by 10 or 15 per cent only, this would obviate the necessity of sending to Java for sugar ships which otherwise will be available for transporting troops and supplies to France.

AGRICULTURE.

The Indian Cotton Seed Crop.

Writing of the unrealised value of the Cotton Seed Crop in India, a correspondent writes in the *Near East*:—

Now that the Home Government is bestirring itself in the matter of research in so many directions, and the vital need of the cultivation of cotton of the American variety within the Empire has at last become recognised, and, indeed, the growing of such cotton in India is making rapid progress, it may be of interest to examine the potential value of the Indian cotton seed crop.

The export of cotton seed from India may be said to have commenced in the year 1897, when about 1,500 tons were sent to seed-crushing mills in England. In 1900-02 the quantity exported rose to about 11,000 tons; the next year it leapt up to 100,000 tons, and it has since reached about 350,000 tons per annum.

Practically the whole of the exports consist of a small fuzzy seed known as "Bombay" seed, but it must not be supposed that this is representative of the whole of the cotton seed produced in India. This particular class of seed has found its way into the export trade must probably because of the small amount of "fuzz" left upon it after ginning, thus enabling it more or less successfully to stand the long sea voyage without undue "heating." The amount of this "fuzz" is not over 2 per cent. of the weight of the seed, and if loaded fairly dry, the risk of heating is not very great. The woollier varieties of Indian seed, such as Tinnevely, Cambodia, etc., which, after ginning, show, according to Mr. Hooper (of the Indian Museum), as much as 8 per cent to 12 per cent of lint, would almost certainly heat badly during the voyage, and if serious consequences in the shape of spontaneous combustion did not ensue the seed would, on arrival, be found to have greatly deteriorated in value for the purposes of oil and cake production.

CLEAN DEFIBRATED SEED FOR EXPORT.

In this connection it is worth while to consider the possibilities attaching to the employment in India of a recently introduced machine by means of which the short lint or "fuzz" left on the woolly varieties of Indian cotton seed after ginning can be removed to any desired degree without injury either to the seed or to the lint product. We are informed that measurements made by an independent authority show that after the removal of about $1\frac{1}{2}$ per cent out of the 2 per cent of fuzz remaining on the Bombay seed, the increase in weight of the seed

contained in a given volume is about 12 per cent., owing to the seed bulking more closely. Clearly, this effect would be more pronounced in the case of the more woolly varieties of Indian seed, and thus, by means of this machine, such varieties could be rendered capable of being successfully exported. It is scarcely necessary to emphasise the many advantages of denuding seed intended for export of as much fuzz as possible before shipping, not only on account of the reduction in the risk of heating, but also because of the saving in freight charges, since the shipper pays freight on the ton measurement of 40 cubic feet, but sells the seed by the ton dead weight. But the main advantage lies in the premium which such cleaned, defibrated seed would command in British markets. Experts in the cotton seed trade in London who have inspected samples of this Bombay seed before and after treatment in this machine state that the cleaned defibrated seed would sell at a premium of about 15s. over that of Bombay seed as now received at British ports. The reason is not far to seek. The way in which seed is handled in India prior to shipment is well known. Accidentally or otherwise, the seed contains a considerable amount of dust and dirt and other debris, which reduce the value of the seed not only in virtue of the reduction of the quantity of oil contained in a given weight, but also because of the expense and loss incurred in the preliminary processes such seed has to undergo in order to remove this foreign matter before the seed can be sent to the press room. This loss may reach 5 per cent of the weight of the seed. Hence the oil content of one ton of cleaned defibrated seed will be proportionately greater than that of a ton of seed as now shipped. The following figures give an indication of the extra return which the shipper should realise by cleaning and defibrating "Bombay" seed in India before shipment:—

Let us commence with 2,400 lb. of Bombay seed. Deduct 5 per cent., or 120 lb., for dirt and debris. Deduct a further $1\frac{1}{2}$ per cent. (say 36 lb.) for the fuzz removed. We are then left with 2,240 lb. of cleaned defibrated seed. The average value of Bombay seed in British markets during the three years immediately preceding the war was about £5 per ton, so that we may take the value of the cleaned defibrated seed at £5 15s. per ton. To produce this 2,240 lb. of defibrated seed the shipper has had to use 2,400 lb. of seed, which, at £5 per ton, would have fetched about £5 7s., so he is about 8s. to the good on this count for every 2,400 lb. seed used, or at the rate of 7s. 5d. per ton undefibrated seed. But this is not all. He would have paid freight on the 2,400 lb. of

* See article entitled "Oils and Fats in the British Empire" in "Staple Trades of the Empire," p. 29 J. M. Dent and Sons, Limited.)

undefibrated seed, whereas he only pays freight on 2,240 lb. of defibrated seed, which, as we have seen above, bulks about 12 per cent. more closely; hence he can ship 12 per cent more dead weight per ton measurement.

SALE OF LINT PRODUCT.

Then there is the net return on the sale of the lint-product to be brought into account. On the basis of the value already established commercially for this product in Great Britain, the net profit on the sale of 36 lb. of this product, after deducting all costs of cleaning and defibrating the 2,400 lb. of seed should not be less than 2s., so that, taking the saving in freight at, say, 2s. 6d., the total extra return would amount to about 11. 8d. per ton original weight of undefibrated seed. If the dirt in the seed were less than 5 per cent this return would be higher and, of course, these calculations, which apply to the small Bombay seed with very little fuzz on them, would apply, *a fortiori*, to the other Indian varieties with 8 per cent to 12 per cent of fuzz upon them.

According to Sir A. D. Steel-Maitland, M. P., "the quantity of Indian cotton seed exported chiefly to the United Kingdom, varies from 100,000 to 400,000 tons per annum, a slight increase in price being sufficient to bring forward largely increased quantities." On these figures, the extra revenue that India might have derived from the export of cotton seed could have reached over £200,000 in a year, a sum not to be despised.

The quantity of cotton seed produced in India is about 2,000,000 tons per annum. Of this, about 180,000 to 200,000 tons are used for planting. Of the remainder, the quantity exported—as we have seen—has not yet exceeded 400,000 tons. There remains, therefore, about 1,400,000 tons to be accounted for. No doubt a large proportion of this is fed direct to cattle, particularly in times of drought, but there must still remain large quantities that are absolutely wasted.

Now that the feeding of cattle has been brought to an exact science, and vast experience has been gained, notably in America, in the value of cotton seed meal and of the decorticated hulls of cotton seed in the feeding of cattle, it is not too much to say that the feeding of cotton seed direct to cattle is an absurdly wasteful proceeding. So far as the intelligent utilisation of cotton seed is concerned, India would appear to be about as far advanced as the United States of America were fifty years ago, when huge piles of rotting cotton seed lying around the gin houses were familiar sights. This is all the more extraordinary because whatever excuse may be made for the want of enterprise fifty years ago in the commercial development of the valuable oil-content of the cotton seed, the fact that as long ago as 1870 the annual crush of cotton seed in Great Britain was 200,000 tons, and the rapid, indeed spectacular, progress of this industry in the United States since, say, the year 1890 has removed any possible doubt as to the industrial value of the products obtainable from cotton seed, and it is therefore a standing reproach to commercial and industrial enterprise in India that at the present day a natural source of enormous wealth should be, to all intents and purposes, still neglected.

EDUCATION.

Universities in Australia.

Mr. C. F. Andrews noting in the *Modern Review* for August says:—

I visited Perth in Western Australia and stayed there for a considerable time making enquiries. There is a rising University at Perth, in a perfect climate. This University charges no fees at all to its students. It is within 9½ days sea voyage from Colombo. A deck passage across would not cost more than £4 or £5 and a second class passage from £10 to £12, and there were large and comfortable fortnightly steamers running before the war began. The University though in its infancy, has already obtained a very able staff of European Professors, especially on the Science side. I met them, one by one, and had long leisurely talks with them discussing the whole problem. They expressed the keenest interest in welcoming Indian Students if only they were ready to come over to Australia. Later on I saw the Chancellor, the Vice-Chancellor and the Registrar and they were equally willing to welcome both men and women students from India. I saw also the Labour Leaders of Western Australia, for labour now yields immense power in all political and social matters. These including the Editors of the Labour Newspapers, gave me their support. Last of all I met the different West Australian Women's organizations—and how ardently they supported the proposal may be easily judged by the letters which have appeared from them in the Indian Press declaring their sympathy with Indian women, in their struggle to abolish indenture. On both subjects—the admission of Indian Students into Australian Universities and the amelioration of the lot of women (Indian) in Fiji I had from first to last the strongest support of the women in Australia.

(I must add in a parenthesis that ever since the attitude of Indian Leaders on that which was in Australia the one supreme issue, *viz.*, the abolition of indentured labour, has been known by the Labour Leaders of Australia, they were willing to support the admission of Indian Students. They have no wish whatever to shut the door of knowledge, however much they may wish to close the door to cheap Indian Labour. Their attitude from first to last was: "You pledge us that you will send no cheap Indian Labour and we pledge you we will not object to your Indian Students coming here to study."

I discussed with the Science Professors in all Universities the openings for study in the different subjects. I should state that the standard in science is high, and some of the most brilliant men are carrying on research with eminent success in Australia. One of the Science Professors at Adelaide obtained quite recently the Nobel Prize.

This will serve to show the standard reached. I gained the following information :—

At Perth, West Australia, mining Engineering, electrical Engineering, and dry farming in Agriculture, were special subjects in which help could be given to Indian Students.

At Adelaide, there were admirable laboratories for Chemistry, Physics and Engineering. There was also a good medical school. The Professor of Chemistry was especially keen to receive Indian Students as his pupils.

At Melbourne, all the chief sciences were represented. The medical course took a high place. Bacteriology was specialised in. Mechanical Engineering was strong. This ranks with Sydney as the Chief University.

At Sydney, Science in its main branches has been a special feature of the University from early days. Medicine rivals that of Melbourne University. Indeed in every way, Sydney and Melbourne are the Oxford and Cambridge of Australia.

I was unable to make full enquiries with regard to Brisbane University, because it was the long vacation when I visited that city. It stands with Perth as among the newer Universities of Australia.

Every one of these five Universities is open to Indian Students. As to the rate of payment—While Perth is free from all lecture and University fees, Adelaide, Melbourne, Sydney and Brisbane have moderate charges. There are scholarships which would be open to Indian Students, and there are possibilities of earning money, by the healthy open-air life of fruit-picking, during the long vacation. Ordinarily tuition fees do not come to more than about £ 20 a year, or Rs. 25 a month. Good lodging and board can be had very cheaply and if a student is economical he should be able to manage all his expenses on 100 to 120 rupees a month. To give an example, I stayed myself at a house close to Adelaide University where the food accommodation was ample and the people of the house were most kindly disposed towards Indians. They would be willing to take two Indian students at Rs. 60 each per mensem. It should be understood that, though travelling and hostels in Australia are expensive, it is always possible to live in one's own house very cheaply indeed on account of the abundant supply of fruit and vegetables and bread and milk.

One further point needs to be emphasised. The climate of Australia is probably the most healthy in the world. This vast Continent, with its deserts, is very sparsely inhabited. The air has never been contaminated with disease germs to any great extent. The sunshine is abundant, and yet there is a bracing cold especially at night. The people themselves are a healthy people. From an Indian point of view I can imagine no life more truly health giving and invigorating than a student life in an Australian University. It is a land of bright days, large open spaces and keen fresh air. The physical stature of Australians is remarkable and I feel certain that Indian students would come back after five or six years in Australia with a new physical vigour that would stand them in good stead for the rest of their lives. There would be none of the terrible depression which most Indian Students feel during the dark cold fogs and sunless winter days of England or Scotland.

FORESTRY.

The Story of Canada's Forests.

The Secretary, Canadian Forestry Association, writes in the *Canadian Forestry* :—

The lumbering industry is probably our most widely distributed manufacturing enterprise. It is also one of the oldest, ranking with the fur trade, and the first attempts at extensive settlement. Since Confederation, and before it, it has retained more than most industries the conservative traditions of independent organization and manufacturing methods.

In numbers of plants, in wider location of woods operations and selling agencies, the growth has been, of course, enormous; but as relates to any mechanical or marketing evolution, a blue print of a group of 1917 saw mills would differ chiefly in bulk from the manufacturing scheme of 1867. There have been refinements, a closing out of the amazing waste at the mill end, a speeding up of processes; but the conservatism of lumbering as compared with the making of shoes, the manufacture of foods the fabrication of steel, is striking and distinctive. Science and invention and market developments have to a great degree spared lumbering from the upsetting changes that have scrapped the machinery and methods of other undertakings in five and ten year periods.

For all that, Canada owes to the lumbering industry an almost incalculable share of her national development. From first to last, the lumberman has been a great employer—an indispensable source of winter revenue to the early settlers, a magnet for foreign capital, a lavish distributor of wealth extracted from a natural resource. To-day, touching only the bald statistics of the thing, the wood using industries of all classes employ more capital, pay more wages, and employ more men than any other industry except Agriculture.

It is an interesting fact that whatever other natural resources we may consider, whatever commercial activity may be under discussion, the necessity for a wood supply enters at one or another stage. The Canadian Pacific Railway, for example, needs annually 5,000,000 track ties, 50,000 telegraph poles and 60,000,000 feet of lumber to operate the system. The coal mines of Nova Scotia or Alberta are dependent upon pit props in great abundance, for it takes six lineal feet of wood for each ton of coal produced. The fisheries require wooden boats, boxes and barrels. The farmer is helpless to extract a dollar from the most fertile land without the accessories of a wooden home and barn, wooden fence

posts and fuel, wagons, implements, churns, and a hundred other products of the tree. Practically no other activity from a daily newspaper to an Arctic whaling fleet can carry on without the aid of manufactured wood.

In the light of the present enormous development of wood-using plants—attaining nearly \$200,000,000 worth of products a year—it is not the least interesting part of the story to find how in the days of our French and English forefathers the public policies towards the mighty forests manifested barely a trace of prophetic vision. None apparently reckoned upon a day when more than 5,000 busy plants lying in a winding chain across the Dominion would look to the forest for their raw materials or when 110,000 men would get their living from the 'fabricating' of trees.

Opening a page of Canadian historical records at 1683 we come upon seigniorial grants conditioned upon 'the preservation of oak timber the building of vessels.' Pine and other woods were merely occupying good room. Only the necessities of the Royal Navy caused any reference to the *value* of a forest in the deeds or land policies of that time. Likewise in 1713, 1747, and other years, we find the French Governors reserving areas for oak timber for ship and bridge building. Down to the close of the French regime no industry had evolved from the forest resources except as applied to labour in getting out naval timbers.

From the time of the occupation of the British in 1763, new demands arose. White pines adapted to naval masting and accessible for water carriage were expressly reserved for use by the Home Government. Thirty four years afterwards licenses were issued to contractors for the Royal Naval Dockyards who in turn sublet the cutting and export rights to merchants and lumbermen in Canada. Therein was provided the first substantial impetus towards extensive exploitation of the forest. The privileges of our present licenses may sometimes seem elastic enough, but what would be said to-day to a timber license, granted in 1808, by the naval authorities, to "travel into and search our woods in our provinces of lower and Upper Canada where we have reserved to us the property in any woods or trees and the right of cutting them, and there to fell and cut so many good and sound trees as may answer the number and dimensions of said contract." A license giving one firm the pick of probably 350,000,000 acres of merchantable timber!

The remoteness of Canada's timber from the European user and the small capacity of ocean carriers was not the worst handicap in our lumber development, for a strange prejudice against Canadian woods had gained hold in the British market.

Giving evidence before a British Parliamentary commission in 1820, Alexander Copland, a timber merchant and builder stated that "Norway, Swedish, Russian, and Prussian timber is very superior quality to that imported from America. The bulk of that is very inferior in quality, much softer in its nature, not so durable, and very liable to dry rot. Indeed, it is not allowed by a professional man under Government to be used, nor is it ever used in the best buildings of London." This sort of buncombe was bound to dissolve before common sense experience, and, indeed, it shortly came that few buyers discriminated against Canadian woods in matter of quality.

The export timber trade of Canada mounted until in 1825 from the one province of New Brunswick 400,000 tons of white pine went over seas. During and after the Napoleonic wars, partly because of the disorganization of Baltic trade, and as much from the desire to encourage Colonial commerce and help pay the battle bill, the timber trade between Canada and the United Kingdom grew until Britain, ninety-seven years ago, imported 335,556 loads (a load equal to 50 cubic feet) of timber from British North America, and 166,600 from European countries. This was a most advantageous change from 17 years earlier when only 12,133 loads were provided by Canada, and 280,550 loads from European countries. In the year of Confederation, 1867, Canada had so promoted its lumber industry as to sell to the United Kingdom \$6,889,000 worth, and to the United States a bill just nine thousand dollars smaller.

As was noted at the beginning of the article, the changes in the lumber industry of Canada since Confederation have been chiefly in respect of extension of volume rather than of evolution of manufacturing methods. It is true that narrowly that period occurred the apotheosis of the square timber trade. Means of quick economical transport by rail have also wonderfully advanced.

More significant, however, has been the striking change in timber values, due to the gradual depletion of once abundant tree species and the growth of population and markets. White pine, so prolifically distributed through Ontario, Quebec and New Brunswick—then, as now intrinsically the most valuable wood we have—has been reduced to rather a poor second to spruce and Douglas fir in the total national cut. It is not to be gainsaid that a great deal more white pine has been delivered to fire than has been turned to commercial purpose. Indeed, the estimate of investigators is that two-thirds of the country's original forest inheritance has been the victim of flames. White pine in New Brunswick does not take better than fifth

place in the average season's cut. The words of a Quebec lumberman testify to a like condition further west. "A boom at my father's mill was practically all white pine, and about five or ten per cent. spruce. To-day the proportions have been reversed." Ontario alone maintains its white pine preponderance year by year.

Our most valuable hardwoods also have suffered. Standing as they did on the agricultural soils of southern Quebec and Ontario, the advance of settlement took small account of future market prices for oak, elm, or walnut. We are, as a consequence, importing most of our precious hardwoods to-day from the United States, and the college building or residence of recent construction will as often as not exhibit oak panelling supplied from Uncle Sam's forests.

Hemlock, too, has supplied another lesson on the necessity of guarding resources for future values. Hemlock in Canada has for long years a trifling value as a source of tan bark. As might be expected, the hemlock supplies of the country went the prodigal way of white pine until now operators are offering prices that a few years ago would have seemed quixotic.

Spruce has become king of the castle. Spruce, white pine, and Douglas fir account for 75 per cent. of the total annual cut, which in 1915 ran to 3½ billion feet, board measure, worth \$619,19,806. Hardwoods represented only about 6 per cent. Over 3 billion shingles are produced yearly, worth about \$6,000,000.

Just as the most important fact in the nickel industry of Canada is the extent of nickel deposits, similarly the lumber industry must be viewed in the light of the living forests. Canada's timber resources are the third largest in the world, ranking after those of Russia and the United States. The estimated present supply of commercial timber, according to the Dominion Director of Forestry, is 500 to 800 billion feet, not an 'inexhaustible quantity when we consider that we are using three and a quarter billion feet a year, and with the population of 1950 will probably multiply the annual consumption several times. The area of 'commercial forest' (not including pulp wood, fire wood, etc., is) reckoned at about 250,000,000 acres, or one half the whole forested area of the Dominion.

British Columbia, with 50 million acres, containing 350 billion feet, board measure, has more large saw timber than any other province. Douglas fir accounted in 1915 for more than two-thirds of the total lumber cut of the province, with redcedar, spruce, yellow pine, larch, etc., varying from 8 per cent. downward. The bulk of the best timber is in the Coast region.

Alberta has about 5,400,000 acres of commercial saw timber amounting to 21 billion board feet, spruce forming the bulk of the annual cut. Saskatchewan timber area is 3,584,000 acres, the contents of which are about 14 billion feet, spruce being the prevalent commercial wood. In Manitoba 1,920,000 acres of saw timber contain about 6,850,000 feet of timber, and of the annual cut of lumber in 1915, spruce formed 93 per cent.

Ontario, accessible to the richest markets of the continent and endowed with excellent transportation facilities from the log to the finished product, placed a value of about \$21,000,000 yearly upon its lumber, lath and shingle production in 1915. Its productive forest areas are from 70 to 90 millions of acres containing approximately 150 billion feet of merchantable timber. White pine, spruce, red pine, jack pine, balsam, fir, tamarack, hemlock, white cedar and hardwoods are present, for the greater part in abundance. In 1915 white pine formed 60 per cent. of the timber cut, hemlock over 10 per cent., red pine 10 per cent. spruce 8 per cent., maple, elm, and twenty other species the remaining 12 per cent.

Quebec contains about 80 to 100 million acres of merchantable saw timber, the coniferous species being about the same as in Ontario. The value of the 1915 lumber, late and single production was 19,196,000. Estimates place Quebec's saw timber at about 160 billion feet. Quebec's white pine represents 15 per cent of the cut against Ontario's 60 per cent. while spruce in Ontario was but 8 per cent of the total cut as against 55 per cent. in Quebec. The claim is sometimes made that the two provinces have approximately the same values in white pine, although statistical proof is largely lacking.

New Brunswick's forest area is a little over 12,000,000 acres with standing timber of about 22 billion feet, spruce being the wood of greatest utilization. Nova Scotia has about 10 billion feet of timber covering more than 5,700,000 acres, the tree species differing little from those of New Brunswick.

As to the future of the lumber industry in Canada, few can doubt that with better trade organization, with aggressive sales methods to meet the increasing inroads of wood substitutes, and the searching out and cultivating of markets—with these elements of efficiency and balance more fully developed, the lumber industry will have an open road to great expansion and prosperity. To particularize on such an experience as that of British Columbia lumber trade during the past three years merely re-states the need for better trade organization, and adequate transportation facilities to take care not only of

foreign export orders, but the demands from the prairies as well. Similar remedies are called for in the East as in British Columbia.

While export orders of British Columbia timbers to Australia, New Zealand and South Africa have been steadily mounting, the evidence of H. R. Mac-Millan, former Timber Trade Commissioner for Canada, who recently visited the Antipodes, is that so firmly established in public favour are timber from the Baltic states and from the United States that Canada must exert prodigious effort to take her place as a serious competitor, although the war has opened the door for valued introductions. At present, British Columbia woods are practically unknown by name in many of the markets and sometimes grossly under estimated as to quality and adaptability.

In total exports of sawn lumber, the country now ranks well up to fourth place in the list of all nations. We send beyond our borders about forty-three million dollars worth a year. About \$10,000,000 of that amount goes yearly to the United Kingdom. Exports of wood in all its forms of Manufacture (including pulp and paper) were valued at \$62,000,000 for the year ending March 31st, 1916. While many lumbermen anticipate a great demand for lumber from the United Kingdom, France, and Belgium after the war, the comparative distances of Baltic and Canadian sources of wood supply have tempered the expectations of others, for the average freight rate from Baltic ports to England is 1½d. as against 4d. from Canadian ports.

The United States lumberman is, to an unrecognized degree, the arbiter of the Canadian price. One may study the barometer of United States lumber production and see at every occasion when production overtops home consumption, or when the magnet of Canadian demand shows extravim, the American mill hurries cargoes across the border. Canadian prices must meet the competition, and do. A quite home demand in Canada and keen trade openings in the United States will, in turn, find the Canadian lumberman bidding in Uncle Sam's home towns. In this way the meeting line of Canadian and American competition swings from side to side of the international boundary. How this works out is seen in the United States sales to Canada and shingles amounting in 1915 to \$6,741,000 and reaching as high as \$14,328,000 in 1913. In the former year Canada sold to the States lumber and shingles valued at \$22,279,891. The total value of the Canadian lumber and shingle production in 1915 was \$69,750,000.

The growth of Canadian agricultural population and the opening up of new districts, building of new farms, homes, and towns, and the parallel

development of manufacturing industries, will give a great and steady impetus to the lumber demand. We North Americans are the greatest wood users on earth, consuming six or seven times the amount per capita of the European. Our rapid expansion of 'plant' accounts only in part for this large discrepancy. Wood in all its forms is a world staple, the variety of uses for which are only now being unfolded by scientific experimentation. It is not too much to predict that within a very few years a wide commercial use will be found for practically every tree species found in Canada and that what is now termed a superfluity of poplar or jack pine, for example, will be counted in with the other rich assets of the timbered areas.

There is no reason to doubt that the present status of the lumber industry in Eastern Canada has been very materially affected by the country-wide neglect of forest preservation measures. Costs of getting out logs have risen steadily with the growing inaccessibility of the forest. That this distancing of the wood supply has been due first to forest fires, few lumbermen will dispute. That the methods of woods operations have not been such as to perpetuate tree growth of the more valuable species on lands cut over, is another factor equally applicable but not as commonly admitted. Economy and efficiency have tightened up the system at the mill end, while as a rule the methods at the woods end have not changed essentially in generations.

The more advanced lumbermen, and particularly pulp mill operators have long been cognizant of the deterioration of lumbered-over tracts, knowing well that if the lands on which the axe has fallen do not fully recuperate, as under present cutting methods they do not, every year brings the industry and the whole nation closer to timber exhaustion. This question of proper cutting regulations and rigid enforcement by the governments is sure to constitute one of the major issues to be reckoned with by wood-using industries in the near future.

The fact is entirely obvious that the hope of the lumber trade lies in a perpetual source of raw materials secured as cheaply as possible. Otherwise, Canada's hope of export trade in competition with those foreign nations enforcing scientific care of woodlands will be rendered vain, and the home market will to a greater degree be occupied by a less expensive array of building substitutes, as concrete, steel, and asbestos.

THE EGYPTIAN INDUSTRIES COMMISSION REPORT.

The Development of Commerce.

The Commission of Commerce and Industry, which was created in March, 1916, under the presidency of H. E. Ismail Sidky Pasha for the purpose of ascertaining to what extent the commerce and industry of the country had been affected by the war, and of suggesting measures having for their object either the creation of new outlets for Egyptian products or the substitution of articles, the import of which had ceased, by other articles produced in Egypt or coming from authorised foreign sources, has now completed its work, and has presented a most interesting report.

Dealing with the commercial position of the country, the report points out that the economic regeneration of Egypt dates from the time of Mohamed Ali, the founder of the reigning dynasty, who made great efforts to encourage industry and agriculture. To this end he invited the collaboration of Europe, facilitated the education of the people and established and started the execution of a general scheme of irrigation works. His work was carried on by Said and Ismail Pasha, and between 1800 and 1880 the external trade of Egypt increased by 3,000 per cent., and her population increased by 400 per cent.; but whilst since then her commerce has continued to rise, the expansion in imports has outstripped that in exports, and the country is more than ever dependent on foreign markets *as the result of being a monocultural country*. The report points out that Egypt was formerly an exporter of cereals, and also a transit house for the surrounding lands, and it expresses the hope that she will once again after the war resume her transit relations with other markets.

DEFECTS IN LEGAL SYSTEM.

Dealing with commercial legislation, the report pays a tribute to the magistracy of the Mixed Courts, who, despite the somewhat defective legislation they are called upon to administer, generally contrive to adapt it to the necessities of the day, and to give decisions which have assisted in the satisfactory solution of the economic and commercial problems confronting the community. At the same time, it calls for certain reforms, such as *a proper form of registration of all persons engaged in trade* with full details of their business and standing, greater publicity as to the position and rights of wives of traders, legislation concerning Egyptian companies offering guarantees to shareholders and creditors by forcing companies to publish their balance-sheets and by fixing the responsibility of directors, etc., and establishing the conditions under which foreign companies should be allowed to operate in Egypt, also

legislation in regard to insurance companies, which at present are free to enforce any policies they like, and are not bound to possess any property in the country as a guarantee towards their policy holders, and laws on trade-marks and warrants. It recommends the application of the law of bankruptcy to non-traders as well as reform of the law re commercial security, full publicity in regard to bills of exchange in circulation and protests in connection therewith, the unification of the system of weights and measures on the basis of the metric system and a more extensive control over the quality of foodstuffs offered for sale.

THE BANKING SYSTEM.

With regard to commercial credit, the view is expressed in the report that there are adequate banking facilities in extence, and that any *extension except in the direction of agricultural banking would not be to the benefit of the country*. It notes with pleasure that one of the effects of the war has been to put an end to the system of unduly long credits which were so freely accorded before the war by importing houses, and thinks that a closer co-operation between the various banks in the matter of commercial intelligence might result in greater assistance not only to the banks in question, but also to trade in particular. It considers that the National Bank of Egypt, which owing to its peculiar relations with the Egyptian Government, has become a sort of State bank, should develop itself in the direction of *a central bank, of a controlling bank of the other banks*, and that a revision of the conditions under which it is allowed to issue banknotes is desirable. It also considers that the time has come for purely Egyptian capital to play its part in the banking system of the country instead of confining its collaboration to making deposits in the banks, *and that there is room for a bank directly designed to assist and protect industrial enterprises*. Its initiation need not be pretentious, but once it was established as a going concern it would play a great part in the industrial development of the country.

THE QUESTION OF FOOD SUPPLY.

The commission gives it as its opinion that the agricultural and industrial activities of the country must be increased so as to relieve Egypt of the danger resulting from her being a one-crop country, so as to make the country independent of outside sources from the point of view of food, in order to provide for the abnormal increase which is taking place in the population and with a view to furnishing the wherewithal for the execution of all the works indispensable to the proper economic and social development of the country. Egypt must as soon as possible put under cultivation the vast area at present lying unproductive—for this it will be necessary to obtain funds from outside—and at the same time she must improve her agricultural methods, which are not in keeping with the times.

As regards transport, the railway system has been developed in a satisfactory manner, but the rates are in many cases too high and a drastic alteration is imperative. Also, greater use should be made of water transport, which could be much

extended seeing the advantages which this country enjoys from its river and fine canal system, a river port is necessary, greater impetus should be given to road construction, and some means should be found for rendering the country less dependent on foreign shipping for the export its products.

COMMERCIAL EDUCATION.

Turning to commercial education, the commission is of opinion that the general state of ignorance which exists amongst the Egyptians as to commercial methods is very detrimental to any progress, and it recommends that the system of commercial education should be greatly developed, *that a year's apprenticeship in a commercial house should precede the granting of a diploma to successful graduates*, and that elementary commercial instruction should be given throughout the lower schools. The report calls attention to the fact that apart from the foreign chambers of commerce there exist no *economic associations* in the country. It considers that there should be a more *active collaboration* between Egyptian and foreign traders and that the Government should give to any movement in such a direction all its support; it also calls for a greater extension of the *statistical service* of the State.

Dealing with the organisation of the external and internal trade of the country the report says that the system of weighing cotton at Alexandria leaves much to be desired, and recommends that weighing by Government weighers should be introduced; it considers that the cotton trade is too much under the influence of foreign exporters, that the transit trade carried out by Egypt on behalf of countries further East could be developed if customs facilities were offered and tariffs reduced, and that this development would not only create a profitable trade for the country, it would set up permanent stocks of commodities required by the country, on which it could draw in emergency, whilst it would open up important shipping and trade connections with lands which are, and it is to be hoped will continue to be on a greater scale, importers of Egyptian products.

ORGANISATION OF IMPORT TRADE.

With regard to the import trade, the commission considers that its organisation is very defective. This applies especially to the very considerable commission agency business, and the Commission outlines certain conditions which foreign merchants should insist on in their contracts with local commission agents, and which would do more to eradicate the abuses, which undoubtedly exist, than any amount of legislation. Coming next to the internal trade in agricultural products the commission says that *the problem of agricultural credit is one of those meriting the most serious attention*, and it considers that *only the introduction of co-operative societies can solve it in a satisfactory manner*. The markets also require proper control and it is also desirable that a proper river port should be created. In concluding this part of its report the Commission says that *all the reforms outlined by it are subordinate to a greater extension of education* and to the development of the national character, the importance of which it firmly believes is realised by the Egyptian Government.

SPEECHES AND PRONOUNCEMENTS.

India's Industrial Development.

The Rt. Hon. E. S. Montagu, M. P., and H. E. The Lord Chelmsford in their joint report on Indian Constitutional reforms have the following to say on India's Industrial Development :—

THE WEAKNESS OF INDIA'S ECONOMIC POSITION.

The economics of a country which depends to so great an extent as India on agriculture must be unstable. Moreover, though as recent inquiries have shown the standard of living among the peasant classes has improved perceptibly of late years, there is still no great margin of taxable capacity. The people are poor; and their poverty raises the question whether the general level of well-being could not be materially raised by the development of industries. It is also clear that the lack of outlet for educated youth is a serious misfortune which has contributed not a little in the past to political unrest in Bengal. But perhaps an even greater mischief is the discontent aroused in the minds of those who are jealous for India by seeing that she is so largely dependent on foreign countries for manufactured goods. They noted that her foreign trade was always growing, but they also saw that its leading feature continued to be the barter of raw materials valued at relatively low prices for imported manufactures, which obviously afforded profits and prosperity to other countries industrially more advanced. Patriotic Indians might well ask themselves why these profits should not accrue to their country; and also why so large a portion of the industries which flourished in the country was financed by European capital and managed by European skill.

INDIAN SUSPICIONS.

Some such complaints began to mingle with the criticism of Government that made itself heard during the time of Lord Curzon's administration; and as it progressed, the movement in favour of an industrial revival tended steadily to assume more of a political colour. The fact that India's foreign trade was largely with the United Kingdom gave rise to a suspicion that her industrial backwardness was positively encouraged in the interests of British manufactures, and the maintenance of the excise duty on locally manufactured cotton goods in the alleged interests of Lancashire is very widely accept-

ed as a conclusive proof of such a purpose. On a smaller scale, the maintenance of a Stores Department at the India Office is looked on as an encouragement to the Government to patronise British at the expense of local manufacture. In 1905 there was instituted as a by-product of the National Congress an annual industrial conference, which had the result of linking the movement towards industrial independence more closely with politics; and the fact that Government officials were allowed and even encouraged to assist the conference failed to compensate for a lack of a more striking manifestation of Government's good-will.

NEED FOR GOVERNMENT ACTION.

In the days of the Company the commercial development of the country was naturally fostered as a matter of business. But the later attitude of Government towards the promotion of industries has been greatly affected by *laissez faire* doctrines and fear of State competition with private enterprise. As the desirability of industrial expansion became clearer, the Government of India fully shared the desire of Indian leaders to secure the economic advantages that would follow the local manufacture of raw products. We have observed elsewhere that English theories as to the appropriate limits of the State's activity are inapplicable to India. We believe that this is true in the case of industries; and that if the resources of the country are to be developed, the Government must take action.

'SWADESHI' AND BOYCOTT

Economic discontents definitely merged in political agitation over the partition of Bengal. The *swadeshi* movement was the positive, and the boycott the negative expression of the same purpose. The advanced politicians took up and tried to put in practice the ideas for new developments promoted by the newly-instituted industrial conference, while at the same time they encouraged or countenanced the boycott, which has been adopted in the hope of bringing pressure to bear on manufacturing opinion at home in favour of the annulment of the partition. These events synchronised with Japan's defeat of Russia, an event which dazzled the imagination of many young educated Indians. In Japanese progress and efficiency they thought they saw an example of what could be effected by an Asiatic nation free of foreign control. Many students helped by scholarships granted by patriotic persons or associations hurried to Japan for technical and industrial training. Many of them returned to take part in *swadeshi* movement of the years 1907 to 1909. Numerous small factories for making matches, hosiery, pencils, cutlery and the like were started, and many collapsed through some or all of the many

ways of breakdown, which must be expected when patriotism is called upon to make good the want of business experience and hard practical training. We are informed that the cause of failure generally was not so much the lack of some degree of technical knowledge as inability to apply it under commercial conditions.

REASONS FOR A FORWARD POLICY.

The ineffective attempt to boycott British goods and the losses and disappointments occasioned by the failures of indigenous enterprises started with high hopes and inspiring motives, were followed by the more serious failures of Indian banks in the Punjab and Bombay. Side by side with this went on the steady progress of enterprises under British control, and a marked expansion of foreign trade. We feel no surprise that there remained a feeling of bitterness among the advanced party. But the moral of these disastrous adventures is one for all parties to read. The people have recognised their inability to carry out their own programme without the help and guidance of Government; and they confine themselves for the most part to pressing their claims for State assistance and for a policy of tariff discrimination against foreign imports. Public opinion has expressed itself again and again in the Councils, on the platform and in the press. Moreover, the war has created a new position. The prohibition of imports from enemy countries was welcomed as giving India an opportunity, spite of the difficulties which best it, of replacing foreign articles by home products. After the War the need for industrial development will be all the greater unless India is to become a mere dumping-ground for the manufactures of foreign nations which will then be competing all the more keenly for the markets on which their political strength so perceptibly depends. India will certainly consider herself entitled to claim all the help that her Government can give her to enable her to take her place as a manufacturing country; and unless the claim is admitted it will surely turn into an insistent request for a tariff which will penalise imported articles without respect or origin. On all grounds a forward policy in industrial development is urgently called for, not merely to give India economic stability; but in order to satisfy the aspirations of her people who desire to see her stand before the world as a well-poised, up-to-date country; in order to provide an outlet for the energies of her young men who are otherwise drawn exclusively to Government service or a few overstocked professions; in order that money now lying unproductive may be applied to the benefit of the whole community; and in order that the too speculative and literary tendencies of Indian thought may be bent to more practical

ends, and the people may be better qualified to shoulder the new responsibilities which the new constitution will lay upon them. These considerations led Lord Hardinge's Government to recommend the appointment of the Industrial Commission which is at present sitting.

MILITARY VALUE OF ECONOMIC DEVELOPMENT.

These are political considerations peculiar to India itself. But both on economic and military grounds Imperial interests also demand that the natural resources of India should henceforth be better utilised. We cannot measure the access of strength which an industrialised India will bring to the power of the Empire; but we are sure that it will be welcome after the war. Mere traders with an outlook of less than a generation ahead may be disposed to regard each new source of manufacture as a possible curtailment of their established sources of profit. But each new acquisition of wealth increases the purchasing power of the whole, and changes in the configuration of trade that disturb individuals must be accompanied by a total increase in its value which is to the good of the whole. Meanwhile, the War has thrown a strong light on the military importance of economic development. We know that the possibility of sea communications being temporarily interrupted, forces us to rely on India as an ordnance base for protective operations in Eastern theatres of war. Nowadays, the products of an industrially developed community coincide so nearly in kind, though not in quantity, with the catalogue of munitions of war that the development of India's natural resources becomes a matter of almost military necessity. We believe that this consideration also is not a matter of indifference to India's political leaders; and that they are anxious to see India self-supporting in respect of military requirements.

DIFFICULTIES AND POTENTIALITIES.

We are agreed, therefore, that there must be a definite change of view; and the Government must admit and shoulder its responsibility for furthering the industrial development of the country. The difficulties by this time are well known. In the past and partly as a result of recent *swadeshi* experiences, India's capital has not generally been readily available; among some communities at least there is apparent distaste for practical training, and a comparative weakness of mutual trust; skilled labour is lacking, and although labour is plentiful, education is needed to inculcate a higher standard of living and so to secure a continuous supply; there is a dearth of technical institution; there is also a want of practical information about the commercial potentialities of India's war products. Though

these are serious difficulties they are not insuperable; but they will be overcome only if the State comes forward boldly as guide and helper. On the other hand, there are good grounds for hope. India has great natural resources, mineral and vegetable. She has furnished supplies of manganese, tungsten, mica, jute, copra, lac, etc., for use in the War. She has abundant coal, even if its geographical distribution is uneven; she has also in her large rivers ample means of creating water-power. There is good reason for believing that she will greatly increase her output of oil. Her forest wealth is immense, and much of it only awaits the introduction of modern means of transport, a bolder investment of capital, and the employment of extra staff; while the patient and laborious work of conservation that has been steadily proceeding, joined with modern scientific methods of improving supplies and increasing output, will yield a rich harvest in future. We have been assured that Indian capital will be forthcoming once it is realised that it can be invested with security and profit in India; a purpose that will be furthered by the provision of increased facilities for banking and credit. Labour, though abundant, is handicapped by still pursuing uneconomical methods, and its output would be greatly increased by the extended use of machinery. We have no doubt that there is an immense scope for the application of scientific methods. Conditions are ripe for the development of new and for the revival of old industries on European lines; and the real enthusiasm for industries, which is not confined to the ambitions of a few individuals, but rests on the general desire to see Indian capital and labour applied jointly to the good of the country, seems to us of the happiest augury.

NEED FOR TECHNICAL DEVELOPMENT.

Many Indians point to the examples of Germany and Japan, and urge that the Government should make up by financial subsidies the ground which has been lost by what they regard as State indifference; and such considerations are doubtless an element in the general desire for greater control over the finances such as our proposals will give them. The extent and form of State assistance will be questions to be determined by the reformed Governments of the future, with the advice of the Industrial Commission before them and with due reference to Imperial interests. But if the speculative element in Government activities is to be minimised, we feel no doubt that there must be a marked expansion of the technical services of the country. The policy of appointing scientific officers to the agricultural services has been attended with a measure of financial success that certainly suggests that opportunities have been lost through the neglect

of other industries which are still backward. We are advised, for instance, that tanning, glassmaking, soap-making sugar-refining, and the manufacture of a great variety of vegetable dyes, drugs and essential oils are instances of industries which are now pursued on primitive lines and which present obvious opportunities for the application of technical science. The old metallurgical and chemical industries of the country, which have fallen even more completely into decay through the importation of foreign articles, also offer opportunities for profitable investment on a large scale if conducted on modern lines.

PROPOSALS OF THE INDUSTRIAL COMMISSION.

The Industrial Commission has not yet submitted its report. But we understand that it is likely to lay stress on a substantial increase in the scientific and technical services of the country and their organization under a separate department of the Government of India, whose business would bring it into close relations at various points with the Department of Commerce, the Army Department, the Department of Education and the Finance Department. We understand that it is suggested that the new department should control the purchase of Government stores and the administration of ordnance factories, and thereby be brought into active touch with industrial development all over the country. We do not wish to anticipate discussion of the Commission's proposals; but we may say that our own inquiry leads us to believe that there are many questions of importance waiting to be taken up by a new agency, and sufficiently related to each other to form the matter for a new administrative unit. We believe that there are also regarded by the public as sufficiently important to be separately recognised. It has been left for the War to bring out fully the need for advance in the industrial sphere as in the sphere of politics. But in any case we can see no reason for hesitating to move forward boldly in a matter in respect of which considerations of military security, political expediency, and economic advantage are coincident, and are in agreement also with the interests of the Empire as a whole.

FISCAL POLICY.

Connected intimately with the matter of industries is the question of the Indian tariff. This subject was excluded from the deliberations of the Industrial Commission now sitting because it was not desirable at that juncture to raise any question of the modification of India's fiscal policy; but its exclusion was none the less the object of some legitimate criticism in India. The changes which we propose in the Government of India will still leave the settlement of India's tariff in the hands of a Government amenable to Parliament and the Secretary of State; but inasmuch as the tariff reacts on many matters which will henceforth come more and more under Indian control, we think it well that we should put forward for the informations of His Majesty's Government the views of educated Indians upon this subject.

We have no immediate proposals to make; we are anxious merely that any decisions which may hereafter be taken should be taken with full appreciation of educated Indian opinion.

DESIRE FOR A PROTECTIVE TARIFF.

The theoretical free trader, we believe, hardly exists in India at present. As was shown by the debates in the Indian Legislative Council in March 1913, educated Indian opinion ardently desires a tariff. It rightly wishes to find another substantial base than that of the land for Indian revenues, and it turns to a tariff to provide one. Desiring industries which will give him Indian-made clothes to wear and Indian-made articles to use, the educated Indian looks to the example of other countries which have relied on tariffs, and seizes on the admission of even free traders that for the nourishment of nascent industries a tariff is permissible. We do not know whether he pauses to reflect these industries will be largely financed by foreign capital attracted by the tariff, although we have evidence that he has not learned to appreciate the advantages of foreign capital. But whatever economic fallacy underlies his reasoning, these are his firm beliefs, and though he may be willing to concede the possibility that he is wrong, he will not readily concede that it is our business to decide the matter for him. He believes that as long as we continue to decide for him, we shall decide in the interests of England and not according to his wishes; and he points to the debate in the House of Commons on the differentiation of the cotton excise in support of his contention. So long as the people who refuse India protection are interested in manufactures with which India might compete, Indian opinion cannot bring itself to believe that the refusal is disinterested by care for the best interests of India. This real and keen desire for fiscal autonomy does not mean that educated opinion in India is unmindful of Imperial obligations. On the contrary, it feels proud of, and assured by, India's connection with the Empire, and does not desire a severance that would mean cutting the ties of loyalty to the Crown, the assumption of new and very heavy responsibilities, and a loss of standing in the world's affairs. Educated Indians recognise that they are great gainers by the Imperial connection, and they are willing to accept its drawbacks. They recognise that the question of a tariff may be mainly, but is not wholly, a matter of domestic politics.

METHOD OF DECIDING THE QUESTION.

We could not conclude our discussion of India's industrial development without some statement of what we believe to be the opinion of educated Indians upon this subject. But our inquiry has not been concerned with fiscal questions; and the views expressed upon them have come before us only as the main reason which those who asked for popular control over India's finances gave in support of their request. It is obvious that any tariff that might be framed for India must take account not only of the views of educated Indians but of the probable incidence of the burden of taxation upon the masses of the population. It has been decided by Parliament that the fiscal relations of all parts of the Empire and the rest of the world should be considered after the war, and we assume that consideration will be by an Imperial Conference on which India will be adequately represented.

MYSORE ECONOMIC CONFERENCE.**Agricultural Committee.**

The following is a brief report of work done during July, 1918:—

INCREASE OF FOOD PRODUCTION.

The most important subject under investigation during the month was the increase of production of food crops. Notes of discussion at an informal meeting held on 17th July, 1918, were discussed by the Committee at their July meeting and recommendations have been submitted to Government with a view to give facilities to the public to bring as much land under the plough as possible.

LIVE STOCK.

Arrangements were made to get the Pilliganahalli pasture ready for the Committee's sheep, which continued to be at Hebbal.

A sum of Rs. 100 was contributed to the Pony Show to be held at Kunigal by the Military Department.

FRUIT CULTURE.

Indents came pouring in (for about 19,000 plants) and the suppliers tried to comply with them, notwithstanding transport difficulties.

Arrangements have been made to get Mr. Cameron's book on "Market Gardening" translated into Kannada. Government have sanctioned an honorarium of Rs. 300 to the author.

DISTRICT AGRICULTURAL CONFERENCES.

A note containing suggestions for increasing the usefulness of District Conferences (copy enclosed) was forwarded to the Districts.

PROGRAMME.

Lists showing the distribution of work among members and constitution of Sub-Committees for considering groups of subjects were prepared in consultation with the members and approved by the Committee.

DISTRICT AGRICULTURAL CONFERENCES.

(By the Secretary, Agricultural Committee.)

I take it that the District Conference is intended to

- (i) take stock of progress,
- (ii) enable agriculturists from different parts of the District to compare notes of work.
- (iii) prepare a scheme of work for the coming year, and

- (iv) disseminate useful information, containing seed-thoughts for future use.

Objects Nos. (i) and (ii) are in some measure served by papers read by leading raiyats giving their experience of particular crops or cultural methods. This part of Conference work, which is perhaps the most important, should be made definite and continuous. Supposing an intelligent and influential man were to first announce that he intended trying such and such an experiment and then to narrate his experiences at the next session, his account of work would have much more value than a sudden essay, however brilliant, produced at the meeting. This practice would enable specially important crops to be entrusted to individual raiyats who take an interest in them and not only could the work be carried on continuously from year to year, but results could be verified by independent experimentation, and the progress of the work would in itself have an educative value to the neighbourhood. I think that at each Conference, this distribution of work should be done. This would necessarily result in a well-considered scheme of work for the coming year.

Object (iv) would be served by officers of the departments concerned being requested to address the meetings on their special subjects, and by the distribution of posters and pamphlets embodying essential information. Such of the notes and papers read at the Conference as are likely to advance the cause of agriculture on modern lines should be printed together and made available to the public at a cost price.

In view to the facts pointed out in Dr. Coleman's Note on agricultural improvement and increase of agricultural production stress should be laid on the development of commercial crops and the replacement of less by more valuable ones. It will be necessary to bring this prominently to the notice of the public and get them to take greater interest than hitherto in the cultivation of Sugarcane, Cotton and Groundnut and other Oil-seeds.

Interest should be stimulated in the study of such important subjects as

- Expansion of cultivation,
- Consolidation of holdings,
- Plantation of fuel and fodder reserves,
- Improvement of live-stock,
- Cultivation of fruit,
- Schemes of subsidiary industries,
- Agricultural Co-operation and the Co-operative use of the more expensive kinds of stock and machinery.

INDUSTRIES AND COMMERCE COMMITTEE.

The following is a brief report of work done during July, 1918.

The Mysore Dasara Industrial and Agricultural Exhibition.—The prospectus of the ensuing Exhibition to be held at Mysore in October next have been circulated to all the Commercial Firms and men throughout India. Construction work of pavilions and various sheds is under progress. Special advances have been given to the local artisans for preparing articles specially for the Exhibition.

Coir Factory.—On the recommendation of the Committee, Government have recently passed orders authorising the Director of Industries and Commerce to purchase and supply the machinery to Mr. Hanumanthe Gowda of Tumkur on certain conditions.

Programme.—Distribution of programme for the year 1918-19 and the formation of the Sub-Committees for a dozen important subjects are engaging the attention of the Committee and the same will be considered to-day.

Loan of Rs. 18,000.—An application received from the Director of Industries and Commerce for a loan of Rs. 18,000 under the Hire Purchase system to Mr. Narniah of Kolar for a 10 cwt. self contained Rice Mill will be considered to-day.

Takkavi Loan.—A loan of Rs. 5,000 to Mr. B. N. Hanumanthappa of Chickmagalur for the supply of a 12 H. P. Oil Engine under the Hire Purchase system was sanctioned by the Chairman during the month.

Standard Development Forms.—The Standard Development Forms have been sent to the District Economic Superintendents with a request to fill up the forms accurately, bring up-to-date and then to return the same. Some of the Superintendents have replied to say that the forms can only be filled up and returned in September next. An up-to-date Standard Development Form may therefore be expected to be ready by the end of September next.

M. N. BALA RAJ URS,

Secretary.

THE MYSORE DASARA INDUSTRIAL AND AGRICULTURAL EXHIBITION.

Progress of Work.

The Committee of Management thought that the existing block of buildings was rather too small for an all India Exhibition and decided to put up some more pavilions and sheds. The construction of these structures on either side of the road leading to the Exhibition premises is almost complete. As at present arranged the stalls in the building proper are going to be set apart for the exhibits from the state proper and the sheds and pavilions for all India exhibits. Particular care is taken to make these temporary structures complete rain proof.

As some difficulties were anticipated for Railway transport of exhibits, the Controller of traffic at Simla was requested to give special facilities for the intending exhibitors. He has now authorised the local Controller of Civil Supplies to issue red passes. A special feature of the ensuing exhibition will be the social side of it. In order to relieve the usual monotony and rigmorole of an Indian Exhibition, attempts are made, however humble they may be, to have a good amusement court. A number of play things will be kept entirely for the Children.

The Catalogue of the ensuing exhibition will be a useful publication. It shall contain in addition to the usual descriptive catalogue of exhibits, short but useful information about the different departments of the State which are having separate courts for themselves. There will also be a short account of the economic situations of the eight districts.

Advertisements of all the retail and wholesale dealers in the State with their lines of business will also be inserted in the catalogue.

Judging will receive prompt attention this year. A representative collection of judges will be selected from all over the State.

Particular care will be taken to return the exhibits carefully packed after the exhibition is over.

EDUCATION COMMITTEE.

The following is a brief report of work done during the months of June and July, 1918.

I. Subjects on the Programme for the year were distributed among twelve sub-committees. Individual members have also taken subjects.

II. Industrial Education.

The following schemes were considered and submitted with recommendations to Government:—

(1) New Weaving Schools on the lines formulated

by the Inspector-General of Education, and with arrangements for compulsory boarding.

(2) Industrial class for training women teachers to be attached to Government Girls' High School, as per recommendations of the Inspector-General of Education.

III. Home Industries.

(1) The audit report on the accounts of the Home Industries Institute, Bangalore, was considered by the Institute Committee and will be soon submitted to Government with the opinion of the Central Committee.

(2) New Committees of management were appointed subject to the approval of Government.

IV. Popular Science Lectures and Books.

(1) A copy of the note by Dr. M. Srinivasa Rao on making the popular science lectures more attractive by selecting subjects bearing on Science applied to industries, was sent to the Kannada Popular Science Association for adoption.

(2) Enquiries are being made regarding the publication of books on Science subjects.

V. Education of Adult Women.

In pursuance of a resolution regarding Adult Education of Women by means of lectures, the first lecture was arranged for at Bangalore. Messrs. Shama Rao and Venkatakrishnayya have been requested to formulate further proposals.

VI. Adult Education.

The Committee resolved that the centralization of various classes be not encouraged and that honorary supervisors be appointed in towns and villages for effecting better supervision. They approved of the curriculum of studies prepared by the Inspector-General of Education.

VII. Ladies' Magazine :—

With a view to the publication of an illustrated Ladies' Magazine, the Kannada Parishath, the leading Ladies' Associations, Mrs. Rukminiamma and Mrs. Sri Srirangamma were addressed, and a notification was also published in the Gazette inviting applications.

VIII. Children's Magazine :—

Estimates for publishing the Magazine were called for.

IX. Popular Lectures.

A recommendation was submitted to Government for their kind approval of the scheme of popular lectures, and for sanctioning the appointment of a lecturer on Rs. 30+30 in two taluks in each District. It was also suggested that the lecturer to be appointed should have passed at least the Upper Secondary Examination. The subjects on which lectures are to

be delivered are (1) Welfare subjects like Sanitation, (2) Cultural subjects like Modern history and Geography, (3) Elementary Science including Ambulance, and (4) Vocational subjects including business training. A magic lantern has also to be provided for each lecturer with an attendant. The work of the lecturers is to be supervised by the District and Taluk Progress Committees, the preparation of syllabuses being left to the Education Department.

X. Miscellaneous.

The appointment of a District Educational Superintendent on Rs. 50-70 under each of the District Committees for helping them in the work of the Education Committee, was also recommended to the Secretary, Mysore Economic Conference.

XI. Institutions working under the Committee.

The work of the two Public Libraries, of the Home Industries Institutes and of the other Home Industries classes, is shown in the appended statement.

J. S. CHAKRAVARTI,
Chairman.

MYSORE EDUCATION DEPARTMENT.

Notification D No. 19 Dated 12th August, 1918.

The following students of the University Entrance Classes are awarded Backward Class Scholarships of the II grade of the value of Rs. 10/- each per month, tenable for one year from 1st July 1918, subject to the usual conditions of satisfactory progress and conduct:—

GOVERNMENT HIGH SCHOOL, BANGALORE.

1. C. V. Channappa.
2. S. Venkatasami Naidu.
3. G. N. Krishnaiya.
4. P. Nagabhushan.
5. A. P. Perumal.
6. R. Madhavan.
7. D. K. Subbaiya.
8. P. Hanumantha.
9. D. S. Rudrappa.
10. Y. Veerappa.
11. B. Gurubasappa.
12. K. Siddalingappa.
13. K. Veerabadrappa.
14. T. Channabasavappa.
15. Siddabasavaiya.
16. B. Channappa.
17. C. Murulaiya.
18. B. S. Nunjundappa.
19. M. Gangappa.

20. K. S. Gangappa.
21. Basappa.
22. V. N. Bettanna.
23. D. Thimmaiya.
24. D. S. Hanumanthachari.
25. N. Dasappa.
26. K. L. Shamanna.
27. K. Subbachetty.
28. T. Kempaiya.
29. M. Munisamaiya.
30. T. Nanjunda Reddy.
31. Narasinga Rao.
32. P. R. Jagapathy.
33. T. S. Margasagayam.
34. T. Ekambaram.
35. Srinivasaiya.
36. Mahomed Jaffer Sheriff.
37. M. Hayath.
38. H. Ahmed Khan.
39. Mahamed Abdul Jaleel.
40. A. S. Khaleel.

WESLEYAN MISSION HIGH SCHOOL, BANGALORE.

1. G. Avalappa.
2. H. Bheem Singh.
3. K. Kallaiya.
4. H. Siddaiya.
5. G. Y. Mallappa.

GOVERNMENT HIGH SCHOOL, TUMKUR.

1. F. S. Bodhachetty.
2. R. Yellappa.
3. D. Dodarangaiya.
4. K. Abdul Khudus.
5. Abdul Jaffer.

WESLEYAN MISSION HIGH SCHOOL, MYSORE.

1. S. Rajagopala.
2. M. V. Raghavalu.
3. P. Swami Das.

MAHARAJA'S COLLEGIATE HIGH SCHOOL,
MYSORE.

1. B. Ramappa.
2. D. Siddaiya.
3. M. S. Basavalingaiya.
4. G. K. Channabasavappa.
5. K. Sikamani.
6. H. B. Gundappa.
7. M. Puttaiya.
8. T. C. Venkatarangampillai.
9. M. R. Veerabhadra Mudaliar.
10. U. Venkata Rao.
11. K. Syed Ghoose Mohiyuddin.
12. Sahib Hussain.
13. Mahomed Hussain.
14. K. Abdul Khudus.
15. Abdul Jaleel.
16. M. Rajaratnam.
17. H. P. Nagarajaiya.

Awards of scholarships classified according to the community to which the students belong.

Total number of applications. 120.

No.	Name of community.	No. of awards.
1.	Banajigar	... 6
2.	Christian	... 2
3.	Ganigar	... 1
4.	Golarl	... 1
5.	Goldsmith	... 1
6.	Jain	... 1
7.	Karunigar	... 1

8.	Kshatriya	... 3
9.	Kunchatigar	... 1
10.	Kurubar	... 3
11.	Lingayets	... 18
12.	Maharatta	... 1
13.	Mahomedans	... 12
14.	Mudaliars	... 2
15.	Nagarathar	... 1
16.	Naidu	... 1
17.	Neygi	... 1
18.	Pillay	... 1
19.	Satani	... 2
20.	Tailor	... 1
21.	Tigala	... 1
22.	Vaisya	... 4
23.	Vokkaliga	... 5

Total... 70

M. S. MEKHRI,

For Inspector-General of Education.

PROGRESS IN THE DISTRICTS.

Chitaldrug.

AGRICULTURE.

Improved Implements.—Twenty-eight ploughs, twenty-seven ploughshares, and some other implements of agriculture were supplied to the ryots by the Agricultural Department.

Fruit Trees.—Fifty fruit trees were planted by Mr. Shadaksharappa of Davangere in the compound of his house.

A Vegetable Garden.—A vegetable garden was formed by Mr. Chennabasappa of Molakalmuru.

A School Garden.—A school garden was formed at Hirehally.

EDUCATION.

Starting of Schools, etc.—One boys' school, two girls' schools, five night schools, one library, and sixteen reading rooms were newly started.

Collection of Funds.—A sum of Rs. 517 was collected for educational purposes.

A School Building.—The villagers of Budihal agreed to contribute Rs. 200 for constructing a school building. The strength of the school rose from ten to twenty-eight.

INDUSTRIES AND COMMERCE.

Fly-shuttle Looms.—Twenty fly-shuttle looms were introduced in the Hosadurga Taluk.

A Carpentry School.—A carpentry school was opened at Davangere.

GENERAL.

A Cattle Show.—A Cattle Show was held at Hartikote in the Hiriya Taluk.

A Kannada Weekly.—A Kannada weekly under the name of *Vrittanta Patnakara* was started.

A Town Hall.—A sum of Rs. 100 was contributed by the people of Harihar and Rs. 80 by the managers of Dramatic Companies for the Town Hall at Harihar, and Rs. 2,000 was contributed by His Holiness the Swamy of the Sirigere Mutt.

A Hotel at Davangere.—The question of starting an up-to-date Indian Hotel at Davangere is under consideration.

Shimoga.**AGRICULTURE.**

An Agricultural Association.—A Taluk Agricultural Association was formed in Shimoga and a sum of Rs. 24 was collected.

Sale of Agricultural Implements.—One sugarcane mill and six meston ploughs were sold in the Shimoga Taluk, and five in the Shikarpur Taluk.

EDUCATION.

Schools Opened.—Seventeen boys' schools, one Panchama School, four girls' schools and six night schools were started in the Shimoga District. A school for the benefit of Halepaika boys was started at Neragallu village.

Aided English Classes.—A sum of Rs. 120 has been collected in each of the two villages Holehonnur and Araga for starting English classes.

Rural Libraries.—Contributions have been collected from seven villages for the opening of libraries.

Special Scholarships.—In connection with the grant of special scholarships varying in value from Rs. 6 to 15 per mensem to Panchama students desirous of prosecuting their studies in any English School in Mysore, the District Committee resolved to request the Central Committee to allot to the Shimoga District ten such scholarships for which the District as well as the Taluk Progress Committees find suitable candidates.

INDUSTRIES AND COMMERCE.

Home Industries Classes.—Home Industries classes in tailoring and mat weaving were opened at Kumsi and Benavalli respectively. A tailoring class for the benefit of ladies was opened at Shikarpur.

GENERAL.

A Savings Bank.—A children's savings bank was started at Kumsi.

CONFERENCES AND MEETINGS.**Chikkanahalli Agricultural School.**

The second anniversary of the Chikkanahalli vernacular Agricultural School was celebrated on the 6th July last, under the Presidency of Mr. K. R. Srinivasaiengar, M.A., Revenue Commissioner in Mysore. The proceedings commenced with an invocation which was followed by the reading of the report on the working of the school during the year 1917-18, by the Deputy Director of Agriculture. The Chairman then distributed prizes and certificates to nine out of eleven successful students. The Chairman presented an iron plough to the first student, while the second was awarded an iron cultivator which was the kind gift of the Taluk Progress Committee. In the course of his concluding speech the Chairman wished that the number of students would rise to twice its present strength and invited the attention of the audience to the fact that short courses of study would shortly be introduced for the benefit of the adult members of the agricultural class who need not necessarily be literate. He wished every prosperity to the institution and thanked the donor for the munificent gift. With a vote of thanks to the Chairman, proposed by Mr. A. Subramanya Iyer, Deputy Commissioner, who is the President of the School Committee, the meeting terminated.

SHOWS AND EXHIBITIONS.**Chikmagalur Cattle Show.**

A Cattle Show was held at Chikmagalur on the 3rd March, 1918. There were about 300 head of cattle at the Show and twenty money prizes of the total value of Rs. 93 were distributed among the owners of the deserving cattle. No fee of any kind was charged on the occasion. Out of the sum of Rs. 200 provided for expenses by the Municipality, a sum of Rs. 101-13-0 was spent. The Assistant Veterinary Inspector delivered a lecture on the improvement of cattle breeding in the District.

RECENT PUBLICATIONS.

Story-Lives of Great Scientists. 8×5½, vii.+266 pp. Wells Gardner. 3s. 6d. From Lord Bacon and Galileo to Sir William Crookes and M. and Mme Curie.

The Rural Teacher and His Work, in community leadership, in school administration, and in mastery of the school subjects. By Harold Waldstein Foght. 8×5½, xiii.+359 pp. Macmillan Co. 7s. 6d. n.

Social Life in Britain. From the Conquest to the Reformation. Compiled by G.G. Coulton. 9½×6, xvi.+540 pp. Cambridge University Press. 15s. n.

Economic Re-construction. A paper read at the Royal Colonial Institute on 15th June, 1916, by Jas. C. Smith. 8½×5½, 24 pp. P. S. King & Son. 6d.

History of Banking in Scotland. By Andrew William Kerr. (Third edition). 8¾×5½, xii.+324 pp. Black.

Banking and Currency. By Ernest Sykes, Secretary of the Institute of Bankers. With an introduction by F. E. Steele, Examiner in Banking and Currency to the London Chamber of Commerce. Fourth Edition (revised). 8×5, xiv.+314 pp. Butterworth. 5s.

The Real German Rivalry. Yesterday, To-day, and To-morrow. By Sir Swire Smith. (New and Revised Second Edition). 8×5½, 87 pp. Fisher Unwin. 6d. n.

Gums and Resins. Their Occurrence, Properties, and Uses. By Ernest J. Parry. (Pitman's Common Commodities and Industries Series.) 7¼×4¾, vi.+106 pp. Pitman. 2s. n.

The Economics of War Finance. Explained in simple words by Sir William B. Forwood, K. B. E., Past President Liverpool Chamber of Commerce. 7¼×5, 50 pp. Liverpool: Henry Young and Son. 6d. n.

Production: The foundation-stone of the State. By James Glass. 8½×5½, 32 pp. Ormiston and Glass. 6d.

The Coming Economic Crisis. By H. J. Jennings. 7¼×5, 136 pp. Hutchinson. 3s. 6d. n.

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THE PLACE OF INDIA IN THE EMPIRE OF THE FUTURE.

BY SIR ROPER LETHBRIDGE,
K. C. I. E.

The supreme fact at this moment in the evolution of the British Commonwealth is that Sir Robert Borden, Mr. Hughes, and their colleagues from overseas—including most properly the representatives of India—are definitely engaged, on equal terms with the Ministers of this country, in the exercise of executive authority over the affairs which concern us all.—The Times, London, 19th June, 1918.

The quotation from the *Times*, which I have adopted as the text for this paper, refers, of course, to the presence of two Indians—His Highness the Maharaja of Patiala, representing the Feudatory Princes, and Sir S. P. Sinha, representing British India—in the Imperial War Cabinet, the small “inner circle of Government” that exercises during its session the supreme executive authority over the affairs of the whole Empire. It is nominated by the Prime Minister of the United Kingdom, and consists of the British War Cabinet of five members, reinforced by the Prime Ministers of all the Dominions or their immediate representative Ministers, and by the two Indian members of the Imperial War Conference, who have been chosen by the Government of India as the embodiment of Indian political knowledge and ability. This great outstanding fact strikingly illustrates the position in the confederation of great nations forming the British Empire,

that India has won for herself, with the hearty assent and applause of the mother-country and the sister-nations, by her steadfast loyalty and enthusiastic devotion to the great cause of liberty, humanity and civilisation. Her proper status is now formally acknowledged to be not that of a “Dependency” of Great Britain, but a Sovereign partner, like the United Kingdom itself, like Canada, Australia, New Zealand, and South Africa, in the powers, the duties and the responsibilities of Empire.

Here, then, we get, in this political fact, the clue that will enable us roughly to sketch the place of India in the Empire of the Future, alike in political, in social, and in economical matters. In this paper I propose to deal mainly with the third category—and I hope your readers will forgive me if I venture, in this connection, to recall with pride and thankfulness the fact that for many years past the main energies of my public life have been devoted to the advocacy of that economical position for India which is now fairly assured for her in the immediate future.

Mr. Montagu's able and exhaustive “Report on Indian Administrative Reforms” has just been published, both here and in India, and your readers will have been able to master for themselves its intricate details before this paper can reach you. The innumerable details of such a great and comprehensive scheme will of course receive an immense amount of criticism, and I doubt not that many useful improvements will be made in them. But I think that the

general principles herein established and developed—laying broad and deep and solid the foundations of responsible self-government in British India, and in Feudatory India enhancing the dignity and powers of the Ruling Princes, and drawing them and their ministers closer to the Viceroy and the Imperial Government—will be acclaimed by all thoughtful patriots throughout India. I hope and believe that the adoption and wise elaboration of these principles—which are in full accord with the admirable speeches of the Maharaja of Bikanir and Sir S. P. Sinha when in England, with the statesmanlike speech in which Sir S. P. Sinha introduced the Panchayats Bill into the Legislative Council of Bengal, and with the political teaching of such representative Indian statesman as that great patriot the late Mr. Gokhale, His Highness the Aga Khan, Sir Gangadhar Chitnavis, and many others I could name—will establish in India a great national political organization that may compare favourably with that of the mother-country or any other great and civilized nation. It has been shrewdly suggested that, among the future Governors of some of the autonomous Provinces of British India, Ruling Princes like the Maharaja of Bikanir might sometimes be persuaded to place their great position and their administrative ability for a time at the service of the Empire in this capacity,—and the extraordinary success and prosperity that has attended the administration of Mysore by His Highness the present Maharaja, worthily treading in the footsteps of an equally illustrious Sire, and aided by such able Prime Ministers as Sir M. Visvesvaraya and the late Sir Sheshadri Aiyar, will certainly make the possibility an attractive one.

It will be seen, from a careful study of Mr. Montagu's Report, that the future of responsible Government within India itself is now fairly assured. It lies in the hands and brains of Indian statesmen and politicians

themselves to complete the edifice, of which the foundations have now been so well and truly laid; and a masterly article in the *Times* of July 8th from the pen of Sir S. P. Sinha—on whom the mantle of the late Mr. Gokhale, as the trusted and revered leader of the Indian *intelligentsia*, has worthily descended—expresses the fullest confidence that the genius of his fellow-countrymen will prove abundantly equal to the great occasion.

Outside India and within the Empire, the political position of India herself, and the political and social status of Indians, have also been fully assured. Not only will Indians be members of the supreme Imperial War Cabinet itself, but their representatives will always henceforward have seats in the annual meetings of the Imperial Conference on a footing of perfect equality with those of the other great States of the Empire; and there will also always be Indian statesmen at the India Office in London as members of the Secretary of States Council. Moreover, the representatives of the Dominions in London, in harmony with those of India, have accepted the principle of reciprocity of treatment and the principle of perfect equality and independence of status as between the subjects of the various States of the Empire.

I turn now to the economical category. Sir S. P. Sinha, in the *Times* letter on the Montagu Report writes:—

“The recommendations in regard to industrial progress are also most encouraging. To my mind, the reforms are of value in the degree and to the extent that they tend to the development of the country, and the most important phase of development needed is industrial. It will be to the advantage not only of India, but of the Empire as a whole, from all points of view—military, social, political, and economic—to press forward

the industrial organization stimulated by the war. I cannot lay too much stress on considerations of such vital import of India and the Empire."

The Secretary of State himself, in a speech to the Society of Arts in London on 20th June, referred to this great subject in terms so full of hope and enthusiasm, that I will ask your permission to quote his remarks at some length. He said:—

"Sir Henry Birchenough's Committee on the Textile Trades after the war was gravely concerned with the future of cotton supplies, and regarded it as eminently unsatisfactory that one of the principal industries of the United Kingdom should be so largely dependent upon one source of supply. They regarded it as reasonably certain that all cotton required by the Empire could be grown, in time, in its own territories, and they regarded India as offering the most promising prospects for any considerable increase of output within a reasonably short time.

As a producer of cotton, India occupied the most important position in the Empire, and everything possible must be done to secure and improve that position. In this respect, at all events, the the interests of India and Lancashire were not antagonistic.

The supply of British-made goods having fallen off, he said, "owing to shipping difficulties and other causes, we had to fall back on the Indian mills for Army supplies, and the cotton textiles required for Army purposes are now being manufactured entirely in India. To meet the requirements of a year 20 million yards of khaki drill, 3½ million yards of khaki

drill shirting, and 17½ millions of khaki puggarre cloth had to be made. Six large modern mills are wholly occupied in making materials for tents, and even the khaki dyes used are now obtained to an increasing extent from Indian resources. All this has given a tremendous fillip to the industry, and one may hope that the ground gained will not be lost when peace comes."

What was true of cotton might be applied to other branches of industry. In his recent visit to India he was greatly impressed with the demands which met him everywhere that more should be done to encourage the manufacture in India of goods of which the raw materials were produced in India. The war had given India many opportunities of developing its own industrial capacities.

India had had to develop its own efforts in order to supply the forces in the field in Mesopotamia and East Africa. The necessity for doing this led to the creation of the Munitions Board in India, and he was satisfied that a most important step had been taken towards fostering in India the growth of industries which she had hitherto neglected. She had a continually increasing number of young men, well educated and competent to undertake the direction of industrial enterprise. As communications developed, there was no reason why it should not have a great industrial future. In India wages were so low that a small rise in the price of food or cotton might threaten the peace of the countryside. It

could not be right that so many should earn so precarious a living.

It is now generally agreed in England that after the war, the most drastic measures must be taken to secure the control of the Empire's resources in the way of food and raw materials for the Empire in the first place, and also to secure that these raw materials shall, as far as possible, be worked up within the Empire. The various fiscal measures necessary to secure these ends have long ago been practically agreed upon, both in the Dominions and in India—see the Debate of 17th March 1913, in the Imperial Legislative Council, and the voting (unanimous on the part of all the Indian members) on the Motion of Sir Gangadhar Chitnavis in favour of Imperial Preferential Tariffs; and the lessons of the war have now brought the United Kingdom into line with the other States of the Empire.

Now, it goes without saying that India is by far the greatest producer of food and raw materials of any country in the whole world. Her help will be eagerly sought, not only by the States of the Empire, but also by allied and neutral States—enemy States will have to do without it. And here comes in the infinite importance and value of the assurances given by the Secretary of State and the Viceroy in this Report (in which, indeed, they only re-echo the promises of the late Viceroy and his Finance Minister) that the Government of India at the end of the war will have a free hand—subject, of course, to those Imperial considerations of mutual and common convenience which must govern us all—to devise and carry out those financial and fiscal measures that they may deem advisable in the interests of India. Indian statesmen will thus be able to devote themselves to the double task—(1) of perfecting her methods of agriculture and forestry and mining, etc., and ruling the distribution of the results through her commerce; and (2) of building up that which is her greatest and most pressing need, a

vast expansion of her own industries and manufactures and commerce, so as to give far more remunerative employment to large masses of her population than is now open to them, and thereby to raise all round both the rate of wages and the standard of living and comfort throughout the country. That is the only possible way by which the immense population of India can be secured against that perennial poverty, which Mr. Montagu feelingly deplored in the closing words of his address to the Society of Arts. Nor will its benefits be confined to the labouring or poorer classes only—they will be thoroughly national, and enrich all classes from the lowest to the highest. A happy and prosperous peasantry means larger and more secure revenues to the owners of land, just as highly-paid and contented artisans produce better returns to the owners and managers of factories and mills.

Moreover, the great expansion of the industrial and commercial life of the country will provide honourable and lucrative employment, and consequent wealth, to the educated youth of the country in the middle and upper classes, not merely or only in the capacity of owners or managers, but in a dozen other ways. Just as the congestion of agriculture as the only really great industry of the country has kept the poorest classes of India terribly poor, so the fact that the only employments practically open to the educated youth of small or moderate means have been restricted to three or four lines of occupation—Government service, the law, teaching, and journalism, for instance—has resulted in a similar or even worse congestion in these occupations, with the same result, comparative poverty. But the perfecting of existing industries and the immense expansion of new ones, which will be the inevitable result of the fiscal, financial, and commercial reforms now imminent, will alter all this, to the enormous benefit of the *alumni* of our Indian Colleges and Universities. The young Indian gentleman who has

obtained and profited by a fairly good education, and has to make his livelihood by it, will no longer find his efforts cramped by the difficulty of obtaining a post in a Government office, or in a school or college, or on the staff of a newspaper. The owners and managers of industrial concerns will always, as in England and America and other industrial countries, be on the look-out for well-educated youngsters of high character and ability, taught in their colleges those lessons of discipline and self-control and public spirit that fit them to become leaders of men; and in the staff of such business-concerns they will in due course naturally rise to highly-lucrative positions of responsibility and honour. So, too, in the great Indian commercial houses of the future—the administration, from the youngest Assistant up to the General Manager, and even the Senior Partner, will afford a career open to talent for Indian University men, not less attractive than the career in the service of the Government or in the practice of the law or in teaching. And in both these lines, both the industrial and the commercial, there will speedily arise a great demand for capable and highly-educated and well-trained men of scientific attainments, such as engineers, chemists, electricians, botanists, who will command good and progressive emoluments and high positions—and these can only be furnished by the Indian Colleges and Universities.

The labours of the Indian Geological Departments have abundantly demonstrated the enormous mineral wealth of the country. We are all familiar with the gold and manganese deposits of Mysore, the coal and iron of Bengal and Central India and the Deccan, the wolfram for tungsten, the bauxite for aluminium—but adverse fiscal and other conditions, now to be amended, have prevented the proper exploitation of these vast hidden stores of national wealth, except in the case of metals that know no competition. We produce more oil-seeds,

more hides and skins, more valuable timber and other woods, more lac, more dye-stuffs, than almost any other country in the world; and yet, for the same reasons, the working-up of these raw materials passed into the hands of Germans and other foreigners—but now all this will be altered, and to the full extent of our capacity we shall be enabled to keep in the country most of this national wealth, and the surplus will be mainly retained within the Empire.

Mr. Montagu, in his Report, eloquently points out some of the political and administrative benefits that will result from the adoption of his proposals, in the following words:—

“Our conception of the eventual future of India is a sisterhood of States, self-governing in all matters of purely local or provincial interest, in some cases corresponding to existing provinces, in others, perhaps modified in area according to the character and economic interests of their people. Over this congeries of States would preside a central Government, increasingly representative of and responsible to the people of all of them; dealing with matters, both internal and external, of common interest to the whole of India; acting as arbiter in inter-State relations, and representing the interests of all India on equal terms with the self-governing units of the British Empire.”

I believe that this hope is not too sanguine and that the Secretary of State's expectations will be realised in such a way as to satisfy every sane and sensible Indian politician and every reasonable well-wisher of India. And I think that by far the best and the most important result of these improved methods of administration is to be looked for in the speedy enrichment of the country at large, and the vast amelioration of the moral and material condition of the masses, that will surely ensue on the adoption of the economical reforms that are now happily in sight

EDUCATIONAL ADMINISTRATION: HOW IT CAN BE IMPROVED.

BY F. H. HAYWARD, D.Lit.,
M.A., B.Sc.,

Assistant Inspector of Schools, L.C.C.

THE Holmes' Circular episode of 1911 is now ancient history and there are those who tell us that a veil should be drawn over it. I shall myself say little about it—I have said enough elsewhere in a 600-paged book on educational administration. But to me the episode appeared at the time, and still appears, full of significance. The Circular was an assertion, from a man who should know, that teachers as a class were unsuitable candidates for administrative posts; it was a confession that the Authors of the Circular had no remedy for the disease they had detected except the remedy of appointing for ever men like themselves, men with their own "antecedents," their own "freshness and originality," their own "complete detachment."

One hardly knows whether most to admire the elements of bitter but absolute truth contained in this famous document or its infertility in practical suggestiveness. Its attack upon "grooviness" in teachers, its plea for "detachment" (in some sense of the word) in men's professional attitudes, its implicit warning (made explicit in Mr. Holmes's other works) against human "egoism," death-like and yet malignant, is an attack that needed to be made; it is an attack, however, that could be made against every profession, and is notably needed in the case of the greatest professions of all. It is when the document proceeds to proclaim the self-sufficiency and self-satisfaction of one class of men—no worse than others but not markedly better and certainly not educational pioneers in the sense that Hall, Bagley, and Thorndike in America are pioneers—that the "tu quoque" retort rises to one's lips: "Egoism

in the teacher is bad; but is egoism in the official any better?"

IMPORTANT QUESTIONS.

The Circular set me to work upon a whole group of questions which, until 1911, had been merely latent in my mind; questions which neither administrators, teachers, nor the lay public seem inclined honestly to face. Is the distinction between head and assistant teacher to be regarded as eternally valid? If it be valid, how are head teachers to be selected from among assistant teachers? Can a lay committee do it satisfactorily, or must it be done by officials? And are such appointments to be made for life, or would not five or ten year periods be better? Why should an exceptionally brilliant class teacher be "promoted" to be head teacher when his real ability is in the class room? And if we are to give great power to officials, what checks can we devise upon their arbitrary or ill-informed decisions? And are officials, powerful or feeble, to be merely critics of teachers, or are they to be constructors also? "La critique est aisee, l'art est difficile."

These questions are avoided by educationists at the present day. It is, of course, not surprising that professional administrators—inspectors, directors, etc.—should avoid them. They have "arrived"; and exacting though their work often is, it is work that is singularly free from worry; they can usually take refuge in all matters of controversy, in the nebulosities of some alleged educational principle; and their salaries, though usually far below those of officials in other departments, are at any rate adequate for a decent life. Thus the poignancy of the promotion question does not touch them. Nor is it surprising that the layman refuses to face such questions. He can as little look inside the teacher's mind as inside the child's, and he therefore knows only from the outside the seething discontent that has settled there, a discontent that has taken a visible form in the dissuasion, by school-masters, of their sons from becoming teachers. But at first there

seems something surprising in the inability of teachers in their organized capacity to grapple with the fundamental question of their own prospects and promotion. Beyond the proposal that the salaries of assistant masters should be considerably raised—and to me it is a mystery how most married class masters can live at all in our large cities—I know of no helpful proposal on this topic emanating from the teachers themselves; the reason is, I think, that there is opposition of interests between heads and assistants, between men and women; and that any proposal bearing on promotion, rotation of positions, salaries, etc., would probably offend one group while conciliating another.

But another reason is that teachers (like the nation as a whole on this matter) cannot make up their minds whether there shall be a strong bureaucracy or not. Until they have made up their minds on this question they may as well whistle for the moon as for a perfect system of promotion. The alternatives are quite obvious. Without a strong bureaucracy there must be wirepulling favouritism, nepotism, infection by clap-trap, judging by superficial qualities, and the like; how is it possible for a lay committee, meeting for a few hours a month, overwhelmed with a multitude of other tasks, ignorant of educational principles, to judge except in a slipshod fashion of relative abilities? The teacher, as a result of this state of affairs, merely hopes that he has a gambling chance of promotion—whether he deserves it or not. With a strong bureaucracy on the other hand there is a good chance for relative abilities to be ascertained, but there is also danger described above as the “egoism of the official.”

THE NEW PSYCHOLOGY.

My own conclusion is that the bureaucratic solution is the only one that will ever prove satisfactory and that the crux of the administrative problem is this: “How to frame a scheme by which professional administrators may be made rigorously accountable for their

selections and promotions of teachers; accountable in the sense that if they promote the wrong or fail to promote the right person they themselves will reap the blame, while, conversely, they will reap a harvest of praise if they prove discerning and courageous? And the scheme I have elsewhere suggested is that our professional administrators should be compelled to keep records of their observations and judgments on teachers—which records will after a period of years be open to the public, the key to them, however, being made known only to a less extent. The next educational epoch is to be an epoch of records; records of pupils, records of officials. The new psychology expounded in books like Münsterberg’s “Psychology and Industrial Efficiency” will play a large part in this system. Certain people possess what is called distributive attention—they can attend to several things in rapid succession, they have the power of quick adaptation or *Anpassung*; certain other people are at their best when they have to concentrate on one task only. Some people enjoy routine, others detest it; some are good visualisers, some are poor visualisers. In short, there are dozens of differences between people that could be ascertained with very little difficulty by a psychologist and the record of which would be of great service in all professions, including that of teaching. At present we seem to assume that the work of a head teacher—which demands, perhaps, more distributive attention than that of a class teacher—is higher and should be paid better, and that the work of an official is higher and better still; we assume these things as a matter of course. But the time will come when, with a system of reliable records at our disposal, not only the psychological records just referred to but the personal records of the people we now call inspectors, we shall be able to place ability exactly where it will be of most service: and then we shall not attempt to bribe a supremely excellent class teacher to leave his work and become a head teacher or an official. He

will get honour in abundance, but not this mischievous kind of honour.

But some one will object that this plan would place too much power in the hands of officials and that a lay committee should have its say in the matter. But this too often means, in practice, that wirepulling, favouritism, casual impressions, floating prejudices, irresponsible judgments, the ebbs and flows of popular fads and crazes, will play a considerable part in the promotion of teachers. The lay check is not reliable enough. The best check on official incompetence and prejudice is the insistence of observational records, provided these records are ultimately published to the world, so that the pre-science (or the opposite) of the official can be judged at the bar of time. The functions of the layman should not be to deal with matters for which he has not the requisite knowledge and time, but to see that the officials do their work well, and to be constantly in touch, on the one side, with the administrative machinery and, on the other, with the great world outside.

I go further and say that some such function as this ought to be discharged by lay or non-specialist bodies in connection with another great profession, which at present, has its own way in everything, I mean the medical. Records should be kept by the medical man of all his cases, and the layman should see that they are both kept and sooner or later published. All men make mistakes, but the ratio of failures to successes ought to be ascertainable in the case of every medical man, otherwise honour does not go where it is due, and, conversely, the doctor who has produced an abnormal number of corpses does not get his fair share of unfavourable recognition.

MODIFIED GAMBLING.

If I could see any alternative to the above proposal of a strong administrative bureaucracy held in check by a system of observations and records, and also to some extent by

a lay committee which, while not looking after details, will see that the system is administered in the right spirit—if I could see any alternative to this I would welcome it. I believe there is none, and I think teachers should face the situation. At present some of them object to investigations into their personal studies, hobbies, etc., they call such investigations “inquisitorial,” and they think (or imply) that there is some other method of investigation, some unnamed, unknown method, of ascertaining merit. I see none. But I see gambling chances in other methods. I see that if officialism is weak, timid, or over-worked, unable to affirm that teacher A is better than teacher B or different from B along certain lines, there is a chance for B to whip up his friends on the committee, or to employ his (or her) personal charms, or to appeal to some of the clap-trap of the hour. I believe that teachers will have to choose between promotion by a strong bureaucracy and promotion by a system of modified gambling. At present they seem to prefer the latter. It is hard to blame them, for present-day bureaucracies are far from attractive and infallible, but the facts must be faced.

Near the beginning of Moliere’s “Misanthrope” there is a quotation which, translated, means that every judgment is based upon preference of some kind, and that if we try to merge everyone into an indistinguishable mass of material for laudation, we shall fail to do justice to a single person in the mass:

“Sur quelque preference une estimese fonde,
Et c’est n’estimer rien qu’estimer tout le monde.”

Many teachers refuse to recognise this. They resent the school record book with its comparative estimates of different class teachers’ work. They forget that if merely laudatory remarks (V. G., etc.) are placed opposite every teacher’s name there will be no reliable basis for selecting the best, and that the only result of such a policy will be to throw more power into the hands of the

officials or the committee. It is no good to make teachers indistinguishable and then complain that the best men are not promoted. Yet this is too often the attitude taken up. I know of a case in which an inspector was denounced, privately at least, because he had taken his duties on the promotion question so seriously as to ask a teacher what was his favourite subject. Apparently the inspector should simply have prowled about in silence and not attempted to get the teacher to unbosom. I repeat that we must have a thorough method of ascertaining the relative merits, or at any rate the distinctive qualities, of teachers if the best men are to be selected for high promotion.

OTHER ADMINISTRATIONAL NEEDS.

I feel inclined to stop at this point for I have dealt with the one matter which is most completely ignored in connection with educational administration. What I have suggested is the only way to the creation of a profession which will have hope and confidence and motives for scientific up-to-dateness and practical efficiency. But a few concluding remarks may be useful as indicating other administrative needs.

Public specimen lessons, competitions by way of educational monographs, an ever open "suggestion book," are some devices which will serve to supplement and occasionally correct, the observational records above described. And I think a system of rotation of offices should, either on a large or small scale, be introduced in order to preserve freshness of outlook on the art of teachers and officials. Such investigations as have been made into the specific value of "experience" show that after a few years its value ceases to increase and therefore that a "move round" is desirable.

It is time that educational administrators made it their business to issue authoritative collections of information on all topics upon which psychology and experience have thrown light. The "liberty" of the teacher should be preserved wherever a problem remains unsolved and therefore in an experimental stage, or where special talents in the teacher call for peculiar opportunities of initiative; "liberty" should be resolutely suppressed or forbidden for a number of years, wherever there is a definite verdict on the part of science. We want more liberty here in our educational systems, and more despotism there.

THE NEED FOR BETTER RELATIONSHIP BETWEEN CAPITAL AND LABOUR.

BY B. SEEBOHM ROWNTREE,

Author of "The Way to Industrial Peace,"
&c., &c.

THE war has temporarily suspended the conflict, ever growing more acute, between Capital and Labour. But unless prompt steps are taken to improve the relation between them, when peace is declared the conflict will probably assume a yet more serious aspect. From patriotic motives, the workers have parted with nearly all the industrial safeguards which they had won so laboriously, and have agreed to many conditions which in normal time they would have resisted stoutly. Again, though some of them, no doubt, have been having "the time of their lives", there are many on whom the high cost of living has pressed very severely, and among whom there is a pent-up feeling of dissatisfaction which will tend to explode when the war is over.

Now, quite apart from the social consequences of industrial strife, it is urgently important to increase the output of wealth in Great Britain. Otherwise we shall suffer from national poverty, with all that it involves of unemployment, suffering, and retardation of social progress.

The problem of increasing the productivity of industry must be attacked from many standpoints. But one condition is absolutely vital to its solution. We must avoid, in future, the enormous loss due to lack of cordial co-operation between Capital and Labour. Certain conditions must be observed if real progress is to be made in this direction.

First, it is absolutely essential that the Government's promise to restore the safeguards of the Trade Unions after the war

shall be honourably kept or that if circumstances have rendered its literal fulfilment impossible, a quid pro quo shall be given which the leaders of the men regard as equitable. No industrial peace can or should be expected, unless that pledge is redeemed.

The second condition of industrial peace is that the unskilled labourer shall receive a wage which will allow him to keep a family of normal size in a state of physical efficiency, with a reasonable margin for recreation. At present millions of people in England suffer because this scale of wages is not universally paid. So long as that is the case industrial peace is neither to be looked for nor desired. Such a minimum wage might be secured by a wide extension of Trade Boards, or by establishing a national minimum. The former course, though less simple, would probably lead to less dislocation of industry. I doubt whether there is any trade in the country of significant proportions, which could not, with possibly some adjustments of methods and improved organization, afford to pay this living wage.

But when we pass these two milestones on the road to industrial peace, the way becomes less clear. Some attractive paths present themselves. One signpost is marked "Profit-sharing", and another "Nationalisation of Industry." For reasons which I have not space to enter into here, I doubt whether the first of these will take us far enough, while the second is so long and so untrodden, that we cannot travel it in to-day's emergency.

I myself believe that at present we must still follow the well-worn highway upon which workers are employed for wages, and have no share in profits, and no responsibility for the financial or commercial management of the business to which they belong. But if we are to reach the goal of industrial peace, we must obey certain rules of the road, which have been too frequently neglected. I have referred to some of them in a previous article, *viz.*, that adequate provision shall be made for the material

well-being of the workers in such matters as healthy work-rooms, canteens, and the length of working day, and that they shall be treated with personal consideration. But even more inclusive and more fundamental is the rule that Capital and Labour shall regard each other as partners in a joint enterprise. In the past the employing class has too largely treated the workers as mere tools, to be hired as cheaply as possible. Each party has been working for its own ends—the employers for the highest profits and the workers for the highest wages. All questions of management, however, have rested entirely with the employers, and the worker's lot was to obey or to leave.

In an organization founded on such a basis, conflict could only be avoided while the workers remained utterly subservient. When they began to realise that labour as well as capital was indispensable to industry, the hope of peace between the two on such terms came to an end.

But it is not any inherent fault in the modern mode of industry, but the spirit underlying it which renders it unworkable. Other systems may arise, but I believe that industrial peace may be found within the present one if we really wish to find it.

What practical steps must be taken by an employer who is anxious to bring a "new spirit" into industry. First, there must be much freer, franker, and more frequent conference between the management and the workers on all matters which affect both parties. To-day, the workers, through their Trade Unions, have won the right to settle certain matters with the employers, though the extent to which they exercise it depends on the strength of their organizations. But Trade Unions are very largely fighting forces whose success is measured by the number and value of the concessions they have wrested from the employer. Something very different is needed. It is, that employers shall say to workers: "Instead of fighting each other, let us unite to make the greatest

possible success of our joint undertaking. Day wage rates, the hours of work, and the principle on which piece rates are based will still be settled in conference between the employers and the Trade Unions, but we want to co-operate as partners in solving the thousand and one questions of works management which are constantly cropping up." In other words, the workers instead of being servants who merely carry out orders, would be invited to share in the responsibility of managing the business on its industrial as distinct from its commercial and financial side.

In practice, this would involve the constitution of Works Councils, and, if necessary, Departmental Councils as well, consisting of equal numbers of elected representatives of the workers and representatives of the management. All questions affecting the workers which has not already been settled by conference between the Unions and the employers, would be submitted to those Councils. They would, for instance, decide such matters as the methods of discipline, how best to cope with pressure or slackness of work, time office rules, canteen management, methods of organizing work with a view to greater efficiency, etc., etc. They would have the right to criticise any individual piece rates, and generally to legislate on matters which mutually affected the workers and the management.

Since their decisions might have a far-reaching effect on the finance of the business, they would necessarily be subject to vote by the directors of the Company, and on the other hand, as they might interfere with Trade Union principles, the Unions must be free to refuse to be bound by a Works Council decision, and claim the right to settle the point at issue direct with the management. But both directors and Trade Unions would be slow to interfere with decisions arrived at by Councils on which workers and management were equally represented.

If Councils of this kind are set up, it is

essential that they shall be given real executive duties to perform, otherwise they may degenerate into opportunities for airing workers' grievances. But if, when a grievance is raised, the Council is made responsible for suggesting a remedy, and if all questions of improving organization, making the best use of existing plant, etc., are submitted to it, then the workers will begin to adopt quite a different attitude. Their status will have been raised, and with it their sense of responsibility.

But, it may be said: "This scheme would not solve the wages difficulty, or alter the fact that, unless a system of profit sharing is introduced, increased efficiency on the part of the workers will only lead to increased profits for the employers."

In reply to this criticism, I would say that in addition to instituting Works Councils, employers must devote much more thought to their wage system than they often do at present. Space prevents me from dwelling on this aspect of the question at length, but briefly it may be said that if men are paid on a level day wage basis, day work tasks should if possible be standardized. If they are paid on piece, piece wage systems should be carefully developed which remunerate men in accordance with their effort. Questions of alterations in piece rates, which lead to so much friction, would be settled in the Works Councils.

Given a well considered wage system, and Works Councils in which employer and employed constantly meet for conference round a table, and where any complaints made by workers, or by employers, could be thoroughly "thrashed out," I believe that a spirit of mutual confidence would soon spring up in most works. Much of the present unrest is due to the fact that masters and men, in modern large scale industries, seldom discuss the matters which affect them both save when some grievance has arisen, and then they meet as opposing forces. If they solve their difficulties together, and adjust their differences as partners, we shall draw far nearer to the goal of industrial peace.

THE WAR AND BRITISH AGRICULTURE.

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THE measures taken in Great Britain towards increased food production in war time are so varied and important that they cannot fail to be of interest to readers of the *Journal*. As is well known, British Agriculture has for a long time been in a helpless condition. Britain's interests were mainly industrial and commercial and her Agriculture has to go to the wall. Unable to compete with cheap foreign grown food which poured into the country in return for British manufactured goods, the production of food grains in Britain gradually dwindled until all but the very best land went out of cultivation and became pasture; at the beginning of the war these pastures amounted to over 66 per cent of the total area farmed, while the area under grain crops was only 16 per cent. Rapid means of Ocean transport and the provision of cold storage on board ships menaced the production on British soil of even what are considered perishable articles, which under ordinary circumstances, would be solely home grown. Meat, poultry, eggs, dairy products, fresh fruits and vegetables, were thus being imported in ever increasing quantities, thus pulling the rope tighter round the neck of the British farmer. The production of fresh milk and of high grade cattle and sheep were about the only lines of profitable farming left on all except the limited areas constituted by "the small holdings." Food was cheap, however, and Britain's industrial and commercial interests prospered, but Agriculture languished, and Britain depended for a large part of her food on foreign supplies. Thus 80 per cent of her cereals, 40 per cent of her meat, 65 per cent of her

fish, 70 per cent of her fruits, the whole of her sugar, 30 per cent of her potatoes and 8 per cent of her dairy produce requirements were all met from imported supplies.

It looked as though this was going to be the established order of things, when the war clouds burst and the flash of its lightning revealed to British statesmen the danger of their situation. Foreign food was intercepted by the commerce raider on the high seas or by the submarine in home-waters and sent down to the bottom of the sea. British shipping too was more and more requisitioned for the transport of men and materials for the war. Britain's accustomed sources of food were therefore failing and unless the British farmer came to the rescue, things would go very bad indeed with the nation.

The Corn Production Act.—More food had to be grown, more land was to be brought into cultivation; the pastures had to be broken and put under the plough, poor farms had to be reclaimed and improved, a hundred years of neglect in fact had to be repaired and repaired at once for the very life of the nation. How could it be done? The farmer could not be coerced into ploughing more land nor could the State undertake such a task; it was colossal. There was only one way and that was to make it worth the while of the farmer to do it. Can the farmer get a remunerative price for his corn, and can he get it, cheap foreign supplies notwithstanding? Can the State in fact guarantee a price which would leave the farmer a good margin of profit? In pre-war days such a proposition would be anathema in this land of Cobden, for it was "Protection" crude and naked. But before the spectre of hunger Cabdenism went to the melting pot and the State took the most momentous step of guaranteeing a minimum price for all home grown corn. All home grown wheat, barley and oats was thus assured a particular price and should the market price at any time go down below that

figure, the deficit would be made up by the State. The Corn Production Act of 1917 definitely laid down this policy. Elaborate safeguards are also provided for ascertaining the amount so grown for which the State guarantee may be claimed, its quality or grade, the market price and so on. Concurrently with this measure of assured prices, to enable labour to share in the benefit, and as far as possible to keep the Agricultural labour on the land, the Act also enforces on the part of farmers the payment of a minimum wage (of 25/- per week) to farm labourers; it prohibits also the enhancement of rents by landlords on the basis of the increased and assured prices.

The Cultivation of Lands Order.—Having thus smoothened the way and made it possible for the farmer to exert himself in increasing the food production of the country, the State armed itself with emergency powers of a most drastic character under the Defence of the Realms Act in order to attain the objects of the scheme in a most satisfactory manner. The Cultivation of Lands Order passed under this act invests the Board of Agriculture with the widest powers. The Board can enter on and take possession of any land which in their opinion is not being so cultivated as to increase the food supply of the country; they can take possession of the buildings, implements and machinery, water or other motive power and utilise the same for the cultivation of the land in the best manner possible; they can direct any farmer to adopt such methods of cultivation as they may direct; they may alter any cultivation scheme, notwithstanding a tenant's obligation to the contrary to his landlord; any farmer refusing to carry out the directions of the Board commits a summary offence against the Act; and the cost of the cultivation which the Board undertakes for him is liable to be recovered from him when the Board withdraws from the occupation. Though armed with such powers, persuasion is about the only important method to be resorted to,

for the working of the Act is entrusted to local committees with numerous sub-committees on which men with local experience predominate.

While the proper cultivation of the land already under occupation claims the first attention of the committees, the cultivation of waste land, of vacant land in the mining districts, of Railway embankments, and even available space in public parts all come within their duties. These areas and arable land not cultivated, or under-cultivated, were to be surveyed and steps taken to deal with them efficiently. The committees work almost entirely through the farmers themselves, the cultivation of even waste lands to be newly broken up and cultivated being entrusted to neighbouring farmers under the committees' directions. The method of granting allotments, that is to say, small areas almost like gardens to be cultivated by individuals whose business is not farming but who attend to the cultivation of the allotment in their spare moments was to be extended.

Labour. (a) Mechanical Power.—The next important problem was the provision of labour. The demands of the war already depleted the existing farms of their young able-bodied labourers to a large extent, notwithstanding the safeguards provided by the tribunals. Recourse had therefore to be had to the use of mechanical power for all the operations in the farm to which it could be used in the place of animal power. Ploughing the land and getting it ready for sowing before the season was too late was the most urgent. The English farmer took a leaf out of American Confrere's book in this respect. A great development has taken place during the last few years in the use of the traction engine for direct ploughing. The English farmer's preference in pre-war days where mechanical power was used for ploughing at all, was for using the Fowler's double engine or single engine system whereby the plough is hauled by cable by one or two engines

which themselves do not move on the field. This cumbrous method has been to a large extent replaced by the direct tractor ploughing, so common in the United States. A number of trials have been held in recent days, several makers have competed, and many excellent outfits small and large have received the approval of the British farmers. This is not without value to us, for there is not the least doubt that as soon as the war is over many among the smaller outfits will find their way into India and become a feature in many tracts. America has shipped these tractors in hundreds during the war. Even the tractors could not displace human labour absolutely; trained drivers were wanted. The Government opened a class straightaway, men were trained, the Government also found the petrol or other fuel and lubricants for these engines and prepared itself to send out a regular crops to undertake ploughing, cultivating, harrowing or sowing, on the application of farmers. Time being of the utmost consideration, traction ploughing outfits worked both day and night, for a period of twenty hours out of twenty-four. Powerful acetylene head lights being provided for the engines for work at nights. The breaking of the sabbath in the holy cause was condoned and the clergy even pronounced their benediction so that traction ploughing on Sundays became as meritorious as psalm singing.

(b) *Animal Power*.—Tractor ploughing and sowing are not the only operations on a farm nor could tractors be used on all farms. Horse teams and men were therefore supplied for periods not exceeding a month in the case of farmers who increase their grain areas by at least eight acres, and to others for shorter periods. If the authorities choose, they may furnish the necessary implements as well. Soldiers of the Home Defence Force, soldiers in certain classes of Reserve are also told off for agricultural labour on the requisitions of farmers. In addition, women labour is being largely resorted to. This

labour was organized, trained, and placed at the disposal of the farmers. The rule that where the Government furnished men out of their supply such as prisoners, the farmer should set free one from among his employees was relaxed, in the case of woman labour, so that he could employ as many women as he cared to, so that skill was made up by numbers. But the skill too has apparently been attained for we read of women doing practically everything on the farm, from ploughing and carting down to the work of the traditional dairy maid. War prisoners, both civil and combatant, furnish the next important source of labour on the farm. Farmers may always apply to the authorities in the nearest prison camp. As far as possible men, trained to the particular work, are detailed under proper guard, provided the farmer employs a batch of at least five. Both Germans and Turks are at the disposal of the farmer, who has now the chance of possessing an Ottoman to sit upon, as *Punch* wittily puts it. School boys and school children are also taken out in teams in the charge of the teachers when light work is on, such as weeding or picking potatoes, so that they can help the farmer and feel they do their bit too.

Seeds and Manures.—The stock of seeds and manures is strictly under Government control, the prices of sale being fixed by the Government. In the case of potatoes, all stock answering to certain standard as to size has been controlled, and none could be sold except with their consent; the requirements of the seed market will take precedence over everything else, except what the farmer may require for his own use. Through proper agencies, the Government itself supplies seed to farmers, especially to the small farmer, or those that do not get it through the recognized trading agencies.

Credit.—With a view to helping farmers to purchase seeds, manures, a short term credit of nine months' duration is arranged, whereby with the approval of the authorities

a farmer may order seeds and manures, the bill being made over to specified banks for payment. The farmer binds himself to pay the amount and interest at 5 per cent at the end of nine months.

Food Conservation.—While these were the measures taken in the direction of extending cultivation with a view to the producing of more food, measures of conservation whereby food could be more economically used have been adopted. It is not that aspect of the question with which most of us are well aware, *viz.*, the rationing of food that I am referring to, although even that is a very important part of a scheme, which applies, however, only *after* the food is produced on the farms. The special measures of conservation which refer to the methods of food production themselves are more interesting. In 1916, at the request of the Board of Agriculture a committee was appointed by the Royal Society to consider and report on the food supply of the Nation, whose recommendations have practically all been adopted in the various measures ordered since. In a nutshell, the principle underlying these recommendations is that which in practice is exemplified in the dietary of countries with huge populations, *viz.*, that no food which can be directly consumed as such by human beings should be fed to animals for the production of meat. The dietary of the meat-eater is highly uneconomical. Any kind of food fit for direct human consumption, when fed to an animal and converted into meat, loses a good percentage of its feeding value, the actual loss being dependant upon the kind of animal product into which it is converted; because, the food fed into the meat making animal system, is used for the production not only of meat fit for human consumption but is used up in the body of that animal; (1) for keeping it alive, (2) for the production of skin, bone, hair and other parts of its body unfit for human food, (3) for the production of such energy

as the animal may have spent in doing work, or in even the moving of itself from place to place; whereas, if the food was fed direct to human beings it is used wholly for their sustenance. That country can maintain the largest population per acre of land, whose food production is so arranged that all the produce of the land fit for human consumption is used as such, and the bye-products and portions of produce that cannot be used directly as human food are converted into meat fit for human use by being fed to animals; and further more that such animals are kept and used for this purpose that give the greatest amount of human food per lb. of the food consumed by itself. Beef animals are the most wasteful and the pig is the most economical in this respect.

The recommendations of the Committee centre round the above principles. In pre-war days the wheat used for bread making was so ground and sifted that only 70 per cent of its weight was used for this purpose in the shape of flour while 30 per cent consisting mostly of the more nourishing, if somewhat less attractive part of the kernel was rejected, to be used for animal feed. A clear, pretty white bread was what the refined citizen wanted on his table; and to meet his taste, this staff of life was, so to speak, so whittled down as not to be fit to beat a dog with. The Committee recommended, and this is now enforced, that this percentage should be raised, both by including what used to be rejected formerly but also by the use of grains like rice, barley and maize to a figure which now reaches 86 per cent. Then comes to restriction of the usual cattle feeds; animals should be fed as far as possible only on grass and grain; and potatoes and other feeds brought down to a minimum. Nothing is gained from the Nation's point of view by fattening cattle beyond $2\frac{1}{2}$ years of age; so the slaughter of these before this age is recommended. The practice of cheese making in preference to butter is recommended, for that gives more direct human food, as all the fat of the butter and the casein (milk proteids) of the milk are made use of as direct human food, while the whey which is the bye-product in cheese making containing the milk sugar is fed to pigs, the most economical meat producer. A great impetus is to be given to pig keeping; town ordinances

against the keeping of pigs within municipal areas are relaxed; in fact if the President of the Board of Agriculture had his way, people would "walk a pig instead of a puppy" provided the pig was fed only on what was not suitable for human food. Likewise the Committee recommended and it has accordingly been ordered,—a great restriction in the manufacture of beer; for that sets free firstly, the large quantity of barley for direct human food; and secondly, if the restriction should be permanent, a large area under hops could be put under food crops. Minor measures refer to the shooting of game, of rabbits, of the collecting of horse chestnuts, acorns and so on, to add to the Nation's store of food.

War Agricultural Committees and other Organizations.—The organization for carrying out this stupendous task is equally large. The apex, is of course, the Board of Agriculture which is the parent authority armed with the wide emergency powers referred to already, and responsible for securing the objects in view. Under the Board and invested with powers delegated by the Board are War Agricultural Committees for each of the Counties, who have an Executive Committee under them, to attend to the work continuously. The committees ramify into sub-committees until the last Parish is reached. Each is given a programme in regard to the area of the land to be brought under cultivation, so that they plan their requirements to obtain the necessary help by way of labour, machinery and so on, in time. The total area for England and Wales which the Board has thus programmed for the harvest of 1918 is 2,000,000 acres or one-eighth of the total area under grass. In the case of Ireland, every holder owning more than ten acres must bring under the plough an additional area of not less than one-tenth of what he cultivated in 1916.

In addition to this organization, Food Production Department working directly under the Board co-ordinates the actual work of the various committees, receives and forwards the requirements in regard to labour, manure or seed and machinery to the proper Departments; and maintains a staff of technical men for advice on all agricultural matters. Clubs, societies and similar peoples' organizations constituted to carry on war work connected with the land also actively co-operate.

AGRICULTURAL EDUCATION IN THE UNITED STATES.

BY "VIATOR."

IN spite of distractions arising out of the war and the political situation, considerable attention has recently been devoted to the subject of agricultural education in India. It cannot, however, be said that much progress has yet been made in evolving a definite policy in regard to it. The questions which arise are undoubtedly difficult of solution and it may be helpful to give a brief account of some recent developments in the United States, as described by Mr. Edward Porritt a short time ago in the *Quarterly Review*. The work of the Agricultural Department in the United States has a special interest for India, not only because its operations extend, as do those of our own Department, over a continent rather than a country, but also because, like India but unlike the United Kingdom or France, the United States possess both a Central Government and Local Governments. It is perhaps unnecessary to remind our readers that the Governments of the different States which make up the United States of America have far greater powers than have the Local Governments in India. Agriculture is, however, by no means a subject which is left entirely to them. The Federal Government provides most of the money for its development and, not unnaturally, retains some measure of control over the manner in which it is spent.

The Department of Agriculture at Washington is a department of the first rank, that is, it is presided over by a Cabinet Minister. Mr. Porritt points out that, with the exception of the Post Office, it is in more close and frequent touch with the hundred million inhabitants of the United States and renders them more constant and direct service than any other department of State at Washington. The Agricultural Department in India

is a long way from rivalling it in that respect. Great as are its activities, it is far from being as much in touch with the people as the Land Revenue Department and it may be doubted whether, counting by heads, it renders them as much service as the Co-operative Department. It should be mentioned that the United States Department does not confine its activities to educational work, using the term in its widest sense as including research and demonstration. It assists largely in the administration of pure food laws enacted by Congress as distinct from those enacted by the different States and in so doing discharges duties which in England are carried out by the Local Government Board and in India are not carried out at all.

It is only with the educational side of the work of the Agricultural Department that Mr. Porritt is concerned. He tells us that agricultural colleges and farm experiment stations which derive much of their income from the Federal Government are established in all the States. The total number of agricultural colleges is sixty-six as some States have more than one. We should have been glad to hear more about these colleges—about their curriculum, the number of students attending them, the class from which they are drawn, their subsequent occupation and so on. Of one thing we may be sure and that they are not regarded merely as an avenue to Government service, though many of the students undoubtedly subsequently obtain employment in the Agricultural Department. The course as now-a-days in the Indian Agricultural Colleges—lasts for four years, extending from October to June in each year. Both it and the numerous shorter courses—also a feature of Indian Colleges—are open to men and women.

The Agricultural Colleges in the United States date from 1862 and owe their inception to the Federal Government, which was then in the happy position of having enormous areas of public land at its disposal. It was with the money accruing

from these lands that the Agricultural Colleges, which are under the direct control of the Governments of the different States, were founded. Each State received an area of thirty thousand acres of land for each senator and representative in Congress and it was laid down that the money derived from the sale of this land was to form a perpetual fund, the interest accruing from which was to be applied to the support and maintenance of at least one college in the State, "where the leading object shall be, without excluding other scientific and classical studies and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the literal and practical education of the industrial classes in the several pursuits and professions of life." It would have been interesting to know how far there has been strict adherence to this object and whether the Agricultural Colleges still teach the "mechanic arts" and also include "military tactics." The words "support and maintenance" in the last sentence but one must not be overlooked. They threw the entire charge of buildings and repairs on the individual States. Each State might use up to 10 per cent of the amount it received from the sale of the land allotted to it for the purchase of a site for a college or an experimental farm but it had to find the money for the buildings it erected.

Until 1887, the Federal Government had no direct connexion with the Agricultural Colleges thus established. It was left entirely to the State legislature to prescribe the course of teaching. As far as the Federal Government was concerned, all that happened was that copies of the annual report of each college, "recording any improvements and experiments made, with their costs and results," were forwarded to the Secretary of the Interior at Washington and to the other colleges. In 1887, however, Congress passed

another Act providing for the establishment of agricultural experiment stations in connexion with the Agricultural Colleges and made grants of £3,000 actually to each State for the maintenance of such stations. The work to be undertaken on these stations was clearly defined in the Act. It is unnecessary to repeat the lengthy definition here, for it was exactly the work which is being carried out at Pusa and, to a smaller extent, on the farms attached to the Indian Agricultural Colleges. The law of 1887 brought the Department of Agriculture at Washington into direct contact with the work of the Agricultural Colleges as it directed that, in order to secure uniformity of methods and results in the work of the experiment stations, as far as possible, it should be the duty of the Secretary of Agriculture to furnish forms for the tabulation of the results of investigations or experiments, to indicate from time to time such lines of enquiry as seemed to him most important and to furnish such advice and assistance as would best promote the purpose of the Act. In 1890 and 1906, additional grants were made by Congress to the Agricultural Colleges and experiment stations and, in 1914, when the Act, known as the Smith-Lever Act, the exact effect of which is described below, was passed, each of the States was receiving from the federal treasury £10,000 a year for its agricultural college and £6,000 for its experiment station. This was in addition to the annual grants made by the States themselves, for, as already mentioned, the cost of erecting new buildings and maintaining old ones falls on them. From 1887 till 1914, a division of the Department of Agriculture was exclusively concerned with the work at the experiment stations. Its functions were to enable the Secretary of Agriculture to certify to the treasury department when federal grants might properly be paid to the State experiment stations, to report to Congress regarding the work and expenditure of the stations, and to aid the stations in the development

of their work. The control of the Department of Agriculture was exercised through the medium of inspectors who visited each experiment station at least once a year and examined its work and expenditure. On the basis of their reports, the grant from the Department was given or withheld. The stations had to submit their schemes of work to the Secretary of Agriculture and these were sometimes modified at his instance. Since 1914, the system has been exactly the same as is here described except that the functions of the division of the Department of Agriculture have been taken over by the "States relation service bureau."

Even before 1914, the Agricultural Colleges were centres of propaganda and, as will be seen, it was with the view of extending their work in this direction that the Smith-Lever Act was passed. That work was being carried on not only in the class rooms and on the experiment stations but also on the lecture platform, through farmers' local organizations, known all over the United States as "granges," at State and local agricultural shows, through the local press and in some States, also through the primary and secondary schools. The Smith-Lever Act placed the Department of Agriculture in a new position in regard to it. It gave that Department a direct part in the teaching of agriculture and farm economy. Although its work between 1887 and 1914 had expanded enormously as is shown by the fact that in 1887, the appropriation for it had been rather under £130,000 as against about £3,30,000 in 1913-14 it had, in the main, been carried out through the State experiment stations and by means of the issue of bulletins and reports. Mr. Porritt gives an interesting account of the publications of the Department. The most widely circulated is the Farmers' Bulletin, a publication of twenty pages written in plain language and adapted to the different sections of the country, "their specific object being to tell farmers how and when to do things."

Seventy-seven of these were published in 1914, and 243 of the earlier ones were reprinted. In 1914, nearly fifteen million of these were distributed, presumably free of cost, though Mr. Porritt does not say so definitely. The Department Bulletins are more specialized than the Farmers' Bulletins and appear to correspond to the bulletins issued by the Pusa Institute. They deal with subjects of special interest to fruit growers, market gardeners, poultry keepers and so on. Included in the Department Bulletins are what is known as Professional Papers, which correspond to the Memoirs issued from Pusa. In these, information on highly technical subjects is communicated to scientists or technologists working in the same or kindred fields of enquiry. The Department Bulletins are issued in editions averaging 6,000 and are distributed free to all applicants. In addition to Bulletins, the Department issues a Weekly Journal of Agricultural Research, which is distributed free to the agricultural colleges and experiment stations and to the technical schools and Universities. There is also the Experimental Station Record which reviews the world's scientific literature on the subject of agriculture and is distributed free to the staff of the colleges and experiment stations. The Weekly News Letter, a quarto sheet of four pages contains news of the more important activities of the Department with articles on farm practice and home economics. Its circulation is limited to the staff of the Department and to crop correspondents and others co-operating in the work of the Department. The monthly Crop Reports answer to the crop forecasts of India but are much more complete and more reliable. Last, but by no means unimportant, is the monthly list of publications which gives a brief description of the publications issued during the month and indication of the region of the country to which each is adapted.

For some years previous to 1914, the propaganda work already mentioned was carried

out by some of the larger Agricultural Colleges with the help of semi-public associations such as the Rockefeller Foundation or from Chambers of Commerce. Itinerant schools for the teaching of agriculture were organized and teachers were sent out to the rural communities. In some States, county agencies were established. Graduates of the colleges, after two or three years actual experience on farms, were appointed resident county agents on the not excessive salaries of £240 to £360 per annum and were required to devote the whole of their time to visiting farms instructing farmers in new and improved methods of work and improving the general farm economy of their counties. Women graduates were similarly appointed for the benefit of the women on the farms. The results obtained were in every way satisfactory. It was found that the work was resulting in more efficient farming, in better kept and more sanitary farm-houses, in the introduction of labour-saving machinery and in better house economy. It was therefore felt that the work required extension and that it was work which ought not to be dependent on semi-public funds but in which the Department of Agriculture should play a fitting part. The outcome of this feeling was the Smith-Lever Act, so called from the names of the chairmen of the Committees of Congress which dealt with the Bill. Under its provisions, a grant of £2,000 a year is made to each of the States for extension work and a second grant based on the rural population of the State is made subject to the condition that a corresponding grant is made by the State legislature. The champions of the Bill during its passage through the legislature explained again and again that the object of the measure was to enable the body of knowledge collected by the Department of Agriculture to be brought home to the people by personal appeal and ocular demonstration. As one speaker phrased it, "You cannot make the farmer change the methods which have been

sufficient to earn a livelihood for himself and his family for many years unless you show him, under his own vine and fig tree as it were, that you have a system better than the system which he himself has been following. The plan proposed undertakes to do that by personal contact, by going on to his farm, under his own soil and climatic conditions and demonstrating that you have a method which in results surpasses his own." The difficulties which confronted the Agricultural Department were emphasized in the course of the debate—the large proportion of farmers who were owners of the land they cultivated but only made a very poor living out of it and had little money at their disposal, the chronic shortage of labour in all farming communities, the large number of farms in the hands of new comers from European countries who could not read English and the large areas in the southern States where tens of thousands of small plantations were rented by negroes. It was for the latter, as one of the most enthusiastic supporters of the Bill pointed out, that the work contemplated by its provisions was most urgently needed. Some hard words were said about American farming as a whole. The much greater production per acre in Europe was dwelt on and the fear was expressed that, unless matters improved, the United States would soon not be producing sufficient to supply their own population. Speakers complained that singularly little had been done for agriculture as compared with what had been done for manufacturers by means of tariffs and for waterside communities by river and harbour appropriation bills. The Bill met with no serious opposition and became law in 1914-15. In 1915-16, some details of its working were furnished to the Committee of Agriculture of the House of Representatives by Mr. C. B. Smith, the chief of the office of extension work. He explained that the Department of Agriculture and the Agricultural College of each State employ a State leader who is in charge

of all county work. The State leader selects the county agent. The latter is a man who understands the science and practice of agriculture and is usually a graduate of the State Agricultural College who has remained in the State and made a success of the practice of agriculture. The State leader takes the agent down to the county where he is to be employed in order to find out whether he is acceptable to the people with whom he will have to work. The agent's business is to bring to that county everything which is appropriate to the locality. Mr. Porritt also gives an extract from the evidence given to the Committee by Mr. Bradford Knapp who is in charge of the extension work in the south. It describes the work of the county agent so vividly that we make no apology for giving it in full. "The county agent goes to a man, and if he can persuade him to become interested in growing better corn (*i.e.*, maize) and in doing it more economically, he says 'How many acres will you take?' The farmer answers that he will take one or five, or whatever it is. The agent says: 'On this land I want you to follow the directions I shall give you. We will put our heads together to discover what is the best way to handle your crop. You follow your own plan on the rest of the farm.' The preparation of the land is gone into; and the county agent tells him what variety of corn he would like to have him plant, and helps him to get a variety adapted to that particular soil and climate. He gives him instructions about planting, and the method of cultivation of the crop. In the fall (that is, in the autumn), the seed is selected for the next crop. The agent shows the farmer the method of seed selection. That corn is harvested, measured and weighed. They get the average of that and the average of the near-by corn and the farmer makes a report to the county agent. Throughout the season the county agent visits the farmer at such times as it is necessary to give him instructions. He may not be there when the cultivation is taking place, but comes around once in every three or four weeks to see how the crop is coming on. When he comes, he invites the farmers of the neighbourhood, tells them what he is doing, and discusses with them the methods which have been employed in cultivating this particular crop." Mr. Knapp

added that in addition to the men, there were 350 women county agents at work in the southern States. A new use for the county agents, both men and women, was discovered when America entered the war and increased food production became essential. Their services are now being utilized as labour recruiting agents for farms—chiefly in recruiting boys from the high schools—and also in assisting the amateur gardeners who, with praiseworthy zeal which requires to be tempered by knowledge, are endeavouring, as in England, to increase food supplies.

The figures of the expenditure in the United States on the Department of Agriculture, with which Mr. Porritt concludes his article, afford food for reflection. In 1916, the expenditure on the Department of Agriculture, on Agricultural Colleges and experiment stations and on extension work amounted to thirty-one million dollars or roughly Rs. 930 lakhs. This would appear to be the expenditure by the Federal Government and exclusive of the grants made by the different States. The expenditure in British India on the Agricultural Department for the same period was about Rs. 53 lakhs. The population of British India is nearly $2\frac{1}{2}$ times that of the United States. We leave our readers to draw the obvious conclusion.

Mr. Porritt's article, in spite of the fact that it deals with only one aspect of Agricultural education is full of instruction for India. It brings out very clearly the great importance which is attached in the United States to demonstration—based, of course, on research. It is regarded as even more essential than an increase in the number of Agricultural Colleges or than the establishment of schools in which the education given shall be definitely agricultural. The point is of special importance as in the negro farmers of the south, the United States have a class which is far more backward than the Indian cultivator. If demonstration is so successful in America, it should therefore be far more so in India. But the demonstrators must be the best men available, men of experience, intelligence and sympathy and above all, they must be numerous. We said above that we left our readers to draw the obvious conclusion from the figures given them but we will here emphasize that conclusion which is that India should spend far more on her Agricultural Department.

AGRICULTURAL INSURANCE—A COMPREHENSIVE SCHEME FOR THE MYSORE STATE.

BY DIWAN BAHADUR J. S. CHAKRAVARTI, M.A., F.R.A.S., ETC.

In the sixth chapter we considered the case of all the taluks in the Chitaldrug district and arrived at conclusions regarding the most important points of an agricultural insurance contract on the basis of rainfall statistics of that district. We found that in that district we might regard a rainfall below 65 per cent of the normal as deficient for the purpose of agricultural insurance both for the January-July and January-October periods. On that supposition the deficiency periods would number about 11 in a total of 80 periods, that is, roughly speaking, in four years embracing eight periods there would be failure in one January-July or January-October period. In this chapter I propose to deal similarly with the other seven districts so that a comprehensive system of insurance may be arrived at for the whole of the Mysore State.

The method adopted will be the same as that applied in Chapter VI. Let F_1 represent failure of rainfall in the January-July period and F_2 that in the January-October period. In the case of each taluk head-quarters stations, the number of F_1 and the number of F_2 will be found out taking into account the rainfall statistics of all years for which a reliable record is available. This period for which reliable records are available varies from 20 years to 45 years in the several taluk head-quarters stations and it is therefore necessary to deduce from the total number of failures, viz., the sum of F_1 and F_2 the proportionate number in a period of 40 years. The number thus deduced represents the number of deficiency periods which may be reasonably expected to occur in 40 years or 80 periods. This number will be calculated on the basis of regarding as a deficiency period one in which the rainfall is less than 65 per cent of the normal. The normal rainfall for a station must, of course, be taken as the figure arrived at after applying to the existing statistics all the checks described in Chapter V.

The talukwar tables for all the districts calculated according to the method described

above are given below together with the conclusions arrived at, in the case of each district. The statistics of rainfall from which the figures for each taluk are deduced will be found in Appendix A, pages 201-277.

From these statistics, it is easy to prepare similar tables on any basis other than the 65 per cent basis or the 35 per cent deficiency basis adopted here.

BANGALORE DISTRICT—65 PER CENT BASIS.

Taluks.	Calculation for 40 years.					Remarks.
Bangalore	... 6 F ₁ plus 3 F ₂ = 9 ;			$\frac{9 \times 40}{43}$	= 9	The whole district clearly comes within the group 11 ± 2 . Only Channapatna, Closepet and Hosakote give eccentric figures. For the two former rainfall statistics are available only for 19 and 20 years respectively, and this may be the reason why the frequency figures do not fall into line with the rest of the district. For Hosakote statistics are available for 27 years and the figures have to be regarded as exceptional to some extent. As, however, the Taluk is surrounded on almost all sides by 11 ± 2 areas, it must be included in that area. From a study of the meteorological conditions of this taluk, there does not appear to be any reason why it should be different from the surrounding tracts as regards frequency of years of deficient rainfall.
Hoskote ...	... 3 F ₁ plus 0 F ₂ = 3 ;			$\frac{3 \times 40}{27}$	= 5	
Dodballapur	... 4 F ₁ plus 4 F ₂ = 8 ;			$\frac{8 \times 40}{29}$	= 11	
Nelamangala	... 5 F ₁ plus 6 F ₂ = 11 ;			$\frac{11 \times 40}{36}$	= 12	
Kanakanhalli	... 6 F ₁ plus 4 F ₂ = 10 ;			$\frac{10 \times 40}{31}$	= 13	
Magadi ...	... 7 F ₁ plus 5 F ₂ = 12 ;			$\frac{12 \times 40}{40}$	= 12	
Closepet ...	... Nil Nil Nil Nil Nil					
Anekal ...	... 6 F ₁ plus 2 F ₂ = 8 ;			$\frac{8 \times 40}{28}$	= 11	
Devanhalli	... 4 F ₁ plus 1 F ₂ = 5 ;			$\frac{5 \times 40}{23}$	= 9	
Channapatna	... 2 F ₁ plus 1 F ₂ = 3 ;			$\frac{3 \times 40}{19}$	= 6	

HASSAN DISTRICT—65 PER CENT BASIS.

Taluks.	Calculation for 40 years.					Remarks.
Hassan ...	... 4 F ₁ plus 4 F ₂ = 8 ;			$\frac{8 \times 40}{42}$	= 8	The western taluks of Manjarabad, Arakalgud and the sub-taluk of Alur naturally fall within the 3 ± 1 zone. The rest of the district is well within the 7 ± 2 area.
Manjarabad	... 0 F ₁ plus 1 F ₂ = 1 ;			$\frac{1 \times 40}{27}$	= 2	
Arakalgud	... 1 F ₁ plus 0 F ₂ = 1 ;			$\frac{1 \times 40}{27}$	= 2	
Belur ...	... 2 F ₁ plus 1 F ₂ = 3 ;			$\frac{3 \times 40}{27}$	= 5	
Channarayapatna	... 2 F ₁ plus 2 F ₂ = 4 ;			$\frac{4 \times 40}{27}$	= 6	
Arsikere ...	... 2 F ₁ plus 2 F ₂ = 4 ;			$\frac{4 \times 40}{27}$	= 6	
Holenarsipur	... 2 F ₁ plus 1 F ₂ = 3 ;			$\frac{3 \times 40}{27}$	= 5	
Alur ...	... 1 F ₁ plus 0 F ₂ = 1 ;			$\frac{1 \times 40}{10}$	= 4	

TUMKUR DISTRICT—65 PER CENT BASIS.

Taluks.	Calculation for 40 years.		Remarks.
Tumkur ...	... 6 F ₁ plus 6 F ₂	$= 12 ; \frac{12 \times 40}{42} = 11$	The whole district falls well within the zone of 11 ± 2 and none of the taluk figures call for any remarks.
Maddagiri ...	... 4 F ₁ plus 3 F ₂	$= 7 ; \frac{7 \times 40}{30} = 9$	
Tiptur ...	... 5 F ₁ plus 2 F ₂	$= 7 ; \frac{7 \times 40}{32} = 9$	
Pavagada ...	... 9 F ₁ plus 3 F ₂	$= 12 ; \frac{12 \times 40}{43} = 11$	
Koratagere ...	... 4 F ₁ plus 2 F ₂	$= 6 ; \frac{6 \times 40}{24} = 10$	
Kunigal ...	... 3 F ₁ plus 5 F ₂	$= 8 ; \frac{8 \times 40}{37} = 9$	
Turuvekere ...	... 4 F ₁ plus 5 F ₂	$= 9 ; \frac{9 \times 40}{30} = 12$	
Chicknayakanhalli ...	... 7 F ₁ plus 4 F ₂	$= 11 ; \frac{11 \times 40}{34} = 13$	
Sira ...	... 3 F ₁ plus 4 F ₂	$= 7 ; \frac{7 \times 40}{24} = 14$	
Gubbi ...	... 6 F ₁ plus 6 F ₂	$= 12 ; \frac{12 \times 40}{43} = 11$	

KADUR DISTRICT—65 PER CENT BASIS.

Taluks.	Calculation for 40 years.		Remarks.
Chickmagalur ...	... 5 F ₁ plus 2 F ₂	$= 7 ; \frac{7 \times 40}{43} = 7$	The district divides itself into two parts, the western falling within 3 ± 1 area, and the eastern within 7 ± 2 zone. The taluk of Kadur as might be expected from its geographical position is within the 11 ± 2 area.
Kadur ...	... 5 F ₁ plus 3 F ₂	$= 8 ; \frac{8 \times 40}{30} = 11$	
Tarikere ...	... 3 F ₁ plus 2 F ₂	$= 5 ; \frac{5 \times 40}{33} = 6$	
Koppa ...	... 1 F ₁ plus 1 F ₂	$= 2 ; \frac{2 \times 40}{32} = 3$	
Mudegere ...	... 1 F ₁ plus 0 F ₂	$= 1 ; \frac{1 \times 40}{33} = 2$	
Yedehalli ...	... 1 F ₁ plus 0 F ₂	$= 1 ; \frac{1 \times 40}{24} = 2$	
Sringeri ...	... 1 F ₁ plus 0 F ₂	$= 1 ; \frac{1 \times 40}{10} = 4$	

SHIMOGA DISTRICT—65 PER CENT BASIS.

Taluks.	Calculation for 40 years.		Remarks.
Shimoga	... 3 F ₁ plus 2 F ₂	$= 5 ; \frac{5 \times 40}{43} = 5$	In the case of this district, there is a compact block comprising the Taluks of Nagar and Tirthahalli and the sub-taluk of Kumsi within the 3 ± 1 area. The rest of the district is within the 7 ± 2 belt.
Chennagiri	... 4 F ₁ plus 4 F ₂	$= 8 ; \frac{8 \times 40}{40} = 8$	
Honnali ...	... 3 F ₁ plus 2 F ₂	$= 5 ; \frac{5 \times 40}{43} = 5$	
Shikaripur	... 4 F ₁ plus 5 F ₂	$= 9 ; \frac{9 \times 40}{40} = 9$	
Soraba ...	... 5 F ₁ plus 4 F ₂	$= 9 ; \frac{9 \times 40}{40} = 9$	
Sagar ...	... 3 F ₁ plus 4 F ₂	$= 7 ; \frac{7 \times 40}{30} = 9$	
Nagar ...	... 1 F ₁ plus 0 F ₂	$= 1 ; \frac{1 \times 40}{39} = 1$	
Tirthahalli	... 2 F ₁ plus 0 F ₂	$= 2 ; \frac{2 \times 40}{30} = 3$	
Kumsi ...	... 2 F ₁ plus 0 F ₂	$= 2 ; \frac{2 \times 40}{30} = 3$	

CHITALDRUG DISTRICT—65 PER CENT BASIS.

Taluks.	Calculation for 40 years.		Remarks.
Chitaldurg	... 5 F ₁ plus 5 F ₂	$= 10 ; \frac{10 \times 40}{43} = 9$	The whole district falls within the 11 ± 2 zone with striking uniformity. The table already worked out in Chapter VI is given here in the same form as those of other districts for the sake of uniformity.
Holalkere	... 6 F ₁ plus 3 F ₂	$= 9 ; \frac{9 \times 40}{39} = 9$	
Challakere	... 7 F ₁ plus 5 F ₂	$= 12 ; \frac{12 \times 40}{40} = 12$	
Harihar ...	... 4 F ₁ plus 3 F ₂	$= 7 ; \frac{7 \times 40}{21} = 13$	
Hiriyur ...	... 7 F ₁ plus 6 F ₂	$= 13 ; \frac{13 \times 40}{38} = 14$	
Hosadurga	... 5 F ₁ plus 2 F ₂	$= 7 ; \frac{7 \times 40}{29} = 10$	
Jagalur ...	... 6 F ₁ plus 3 F ₂	$= 9 ; \frac{9 \times 40}{41} = 9$	
Molakalmuru	... 4 F ₁ plus 4 F ₂	$= 8 ; \frac{8 \times 40}{27} = 12$	
Davanagere	... 5 F ₁ plus 5 F ₂	$= 10 ; \frac{10 \times 40}{36} = 11$	

KOLAR DISTRICT—65 PER CENT BASIS.

Taluks.	Calculation for 40 years,			Remarks.
Kolar ...	... 3 F ₁ plus 6 F ₂ = 9 ;	$\frac{9 \times 40}{43}$	= 9	
Bowringpet ...	... 3 F ₁ plus 1 F ₂ = 4 ;	$\frac{4 \times 40}{20}$	= 8	
Chintamani ...	... 7 F ₁ plus 4 F ₂ = 11 ;	$\frac{11 \times 40}{41}$	= 11	
Mulbagal ...	... 3 F ₁ plus 2 F ₂ = 5 ;	$\frac{5 \times 40}{20}$	= 10	
Siddlaghatta ...	... 7 F ₁ plus 6 F ₂ = 13 ;	$\frac{13 \times 40}{41}$	= 13	
Chickaballapur ...	... 7 F ₁ plus 4 F ₂ = 11 ;	$\frac{11 \times 40}{42}$	= 10	
Bagepalli ...	... 2 F ₁ plus 3 F ₂ = 5 ;	$\frac{5 \times 40}{20}$	= 10	
Goribidanur ...	... 6 F ₁ plus 3 F ₂ = 9 ;	$\frac{9 \times 40}{30}$	= 12	
Malur ...	... 2 F ₁ plus 0 F ₂ = 2 ;	$\frac{2 \times 40}{20}$	= 4	Figure eccentric.
Srinivasapur ...	... 7 F ₁ plus 2 F ₂ = 9 ;	$\frac{9 \times 40}{28}$	= 13	
Gundibanda ...	... 5 F ₁ plus 4 F ₂ = 9 ;	$\frac{9 \times 40}{28}$	= 13	

The whole of the District falls well within the 11 ± 2 zone. The eccentric figure of Malur is evidently due to the rainfall statistics being available only for 20 years.

MYSORE DISTRICT—65 PER CENT BASIS.

Taluks.	Calculation for 40 years,			Remarks.
Mysore ...	... 5 F ₁ plus 2 F ₂ = 7 ;	$\frac{7 \times 40}{30}$	= 9	
Chamarajanagar ...	... 9 F ₁ plus 2 F ₂ = 11 ;	$\frac{11 \times 40}{30}$	= 14	
Seringapatam ...	... 5 F ₁ plus 4 F ₂ = 9 ;	$\frac{9 \times 40}{41}$	= 9	
Hunsur ...	... 4 F ₁ plus 1 F ₂ = 5 ;	$\frac{5 \times 40}{42}$	= 5	
Yedatore ...	... 4 F ₁ plus 7 F ₂ = 11 ;	$\frac{11 \times 40}{43}$	= 10	
Heggadadevankote ...	... 6 F ₁ plus 2 F ₂ = 8 ;	$\frac{8 \times 40}{30}$	= 11	
Gundlupet ...	... 4 F ₁ plus 4 F ₂ = 8 ;	$\frac{8 \times 40}{36}$	= 9	

The taluk of Hunsur to the extreme west, bordering on Coorg, is, as might be expected, in the 7 ± 2 zone. The rest of the district falls within the 1 ± 2 zone with striking uniformity.

MYSORE DISTRICT—65 PER CENT BASIS.—(Contd.)

Taluks.	Calculation for 40 years.		Remarks.
Nanjangud	... 5 F ₁ plus 4 F ₂ = 9 ;	$\frac{9 \times 40}{30} = 12$	
T. Narasipur	... 9 F ₁ plus 2 F ₂ = 11 ;	$\frac{11 \times 40}{42} = 11$	
Malavalli	... 6 F ₁ plus 7 F ₂ = 13 ;	$\frac{13 \times 40}{40} = 13$	
Mandya ...	... 7 F ₁ plus 1 F ₂ = 8 ;	$\frac{8 \times 40}{30} = 11$	
Krishnarajapete	... 5 F ₁ plus 7 F ₂ = 12 ;	$\frac{12 \times 40}{41} = 12$	
Nagamangala	... 4 F ₁ plus 6 F ₂ = 10 ;	$\frac{10 \times 40}{38} = 11$	

It will be seen from the foregoing tables that the taluks in the Mysore State fall within three well-defined groups according to the frequency of years of deficient rainfall. In the first group, the number of deficiency periods in 40 years or 80 periods is 11 ± 2 , in the second 7 ± 2 and in the third 4 ± 1 . Appendix III gives a statement of taluks arranged according to district shewing in which group each taluk falls, and Appendix V is a map of the Mysore State shewing the three distinct areas. As may be expected all the *maidan* taluks are included in the first group, most of the *malnad* taluks in the last group, and there is an intermediate belt between the two included in the middle group. The fact that the State divides itself so definitely into three continuous and well-marked zones according to the frequency of years of rainfall deficiency is one of the most striking results of these investigations.

HEALTH AND MALNAD SERVICE.

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The writer has had to execute considerable amount of work in the *malnads* of Mysore State and has found during his experiences that subordinates employed in the *malnad* (i.e., the hilly, jungly and malarial tracts such as Shimoga District) do not devote sufficient care to their health. He goes so far to say that they do not understand why Government allows them an enhanced rate of "bhatta" or allowance. When sub-overseers or maistries submit claims for the *malnad* allowances, the officer passes them in the sincere hope that the increased allowance will be spent by the staff in combating certain pernicious climatic conditions in the *malnad* tracts, but the writer regrets to say that he never found any sub-overseer or maistry willingly doing so, till pressure was brought to bear upon them. In this article, the writer has tried to give certain simple suggestions and

remedies which will cost very little and which will conduce to better health and thus better efficiency.

NO. 1. DAMPNESS.

In the *malnad* tracts, such as Shimoga District one can easily spoil one's health by not guarding against dampness. While camping at various places, under the cover of tents specially, the writer noticed that between the early hours of morning a humid layer or air covers the ground. The writer while sleeping on his camp cot (and this too in February, March, and April, the driest of months) was often awakened early morning by a peculiar shivering sensation and on examining the bottom portion of the canvas, invariably found it humid. Very often, in the early hours of the morning one can see a white mist covering the lands in the distant. It is not possible, for obvious reasons, to *see* the mist from where one is standing, but one can say that it is there by the *humidity*.

Now any average man can readily realise that under such conditions to sleep on the ground is to court lumbago, rheumatism, piles and a host of other troubles. The average subordinate generally sleeps on a thin bedding spread on grounds. This is surely wrong. All wise self-respecting subordinates should not hesitate to spend Rs. 15/- for a cheap folding camp cot. It will pay them, for they can take the writer's word that eventually their health *will* suffer. They must make a point of sleeping at least a foot and a half above bare ground.

NO. 2. EYE STRAIN.

The remarks under this heading are essentially directed to those who have to work with surveying and other instruments. It would be meaningless to say that the eyes of the people of India are better able to withstand the fierceness of the tropical sun just because they are born in India. Nature may have given Indians eyes a darker colouring matter which may to a very slight

degree protect the eyes under normal conditions, but looking through telescopes (which concentrate sun's rays) are *not normal conditions*. Still, see what happens. One generally finds a subordinate doing Theodolite work or the eye straining levelling work in a blazing hot sun without any adequate protection for the eyes!

It is not difficult to understand that human eyes (or any eyes) continually exposed to the glare of the hot sun must suffer a lot. Do the subordinates realise that 75 per cent of the headaches, feelings of nausea, of irritation, sleeplessness, are due to their having exposed their eyes (more than is fair to them) to the rays of the sun. Do they realise, that by continually looking through the Theodolite and levelling instrument's telescopes they are throwing a tremendous concentration of rays on the delicate retina of their eyes. Let us examine for a moment the composition of a white ray coming from the sun.

Generally it is known that the white ray is composed of seven rays of different colours, *viz.*, violet, indigo, blue, green, yellow, orange, red, (remembered by the composite word *vibgyor*.) If pieces of wax were to be placed in the sun below different coloured pieces of glass, the one under red will melt first, next to melt will be that under orange, after that the yellow glass covered one, and so on, reading from right to left. Reverse is the order of activity if chemical activity is considered. But wait, these are not all the rays. Preceding the violet rays and following the red rays are the ultra violet and infra red rays. The eye machinery cannot *see* them but the effects of these *are there* all the same, injurious beyond measure in their chemical and hearing activity. They form a ruthless unseen foe.

Volumes can be written and have been written on these and other wonderful rays known as the Finsen, the N, the X, etc., rays but enough has been said in this article

to put the reader on his guard. The remedy and protection is in his hand. Wear sun glare glasses while working in the field and exposed to the concentration of the sun's rays through the telescopes of surveying instruments. In case they do not know, the writer begs to inform them that there are various kinds of sun protection glasses on the market, smoke coloured or those fitted with more expensive Rasophyll lenses (advocated by Lawrence & Mayo). The price of sun glare glasses range from one rupee to as much as fifteen rupees. The choice is wide in the open market. Bangalore contains a splendid eye infirmary and a prescription can be easily obtained by those suffering from eye strain, for some soothing drops, which when placed in the eye, refreshes the tired muscles. For those whose eyes are naturally weak, the advice is to give up one day in the week all reading and rest in a darkened room and thus give a complete relief and rest to the tired eye muscles. Inflammation of the eyes due to continual instrumental is a complaint which requires treatment and should not be neglected. Many head complaints will vanish if the eyes are carefully tended and looked after and provided that, cheap glasses (having power) are not bought in the bazaar and worn by the short-sighted man just because he thinks he can see a little better with them.

NO. 3. THE SOLAR HEAT.

Strange to say, invariably one finds the subordinates while working during the full heat of the day, wearing a very small turban (with no tail end) bending over their instruments and thus exposing their bare necks to the full play of harmful rays. Generally, we know that the white ray of the sun is composed of seven visible rays,—violet, indigo, blue, green, yellow, orange and red, but how many know that there are the ultra violet and red rays, invisible to the eye, but terrible in their chemical activity.

To make the matter more clear the writer would add that the brain controls all the nerver, etc., by means of the spinal chord, which passes tightly bunched up just at the back of the neck, *the nape*. These are the minute thread like telegraph wires carrying messages from the brain to all parts of the body. The spinal chord is extremely sensitive and must be always protected against the harmful effect of sun's rays. Sometimes one hears somebody boasting that he does not mind, sun won't affect him. He is making a mistake. The cumulative effect *does tell* later on, on the constitution. Strange is it not that the people of India left it to others to invent the sun hat or the sola topee? In the Northern India the writer noticed the tail of the pughdee was in some cases spread out over the nape of the neck to protect the same from sun's rays, but he does not find that in Southern India. Men working outdoors should not hesitate to carry umbrellas, or wear sola topees, or at least attach a piece of felt to the back of the turban so that it may fall over and cover the nape of the neck and thus protect the spinal chord.

One day, on a hot day in April (and that even at low attitudes) the writer saw two of his men walking perfectly bareheaded to their destination five miles away. That night I believe one man suffered with intense headache and the other, a day or two after, commenced having fever and completely spoilt his health for days to come. Exposure to sun for a short period may not be harmful for some men but it is the continued exposure to sun that should be guarded against. Sola topees cost from Rs. 2-8-0 to Rs. 16-0-0.

NO. 4. INSECT BITES, SCRATCHES AND CLEANLINESS.

A maistry once had severe leech bites on his ankles and feet. Permission was given to him to go to the local hospital to get treatment, because his feet and ankles were bad. A few days later he

returned stating that he was now getting on quite all right. A month afterwards, the writer was told that he was again unable to go out as his foot had re-swollen up from the old complaint. The writer saw him and guessed wherein lay the true cause of all this.

Sub-overseers generally wear socks and boots when they go to their work, quite a good practice, especially in jungle and thorny tracts. Now socks are not a cheap item, so in their case they generally do go on wearing the same pair for quite a long time. In India, socks get soiled very easily due to the dust and perspiration from the feet. After a tramp, socks should be invariably soaked in water, squeezed out and dried for wear next day. If this is not done the user will be wearing the next day close to his skin a garment full of poison and dirt which will irritate the *tender texture* of the skin and thus make his feet hot, swollen and uncomfortable for want of pure ventilation. When the writer recommends washing of socks daily after wear he does not mean that they should be every day soaked in boiling water and soap, and that they should be pounded on a stone and get their life squeezed out, thus spoiling the quality of the socks in one-fiftieth of the time they should last. Far from it. What he means is this—that the pair of socks may be dipped in water, squeezed out and hung out in sun and air to dry, and when wearing them again, the user should get hold of the socks in his right hand and beat them on the left, thus knocking out the injurious dust out of the same. To be brief, I told the maistry to carry out the above instruction daily and further to keep his feet clean and wrap a thin *clean* piece of cloth, (previously soaked and dried in a weak solution of Potassium Permanganate and water) round his ankles (till he was cured) and wear the socks above them. In a week he was quite all right.

There is such a thing as 20 per cent pure

carbolic acid soap prepared by Messrs. Calverus and obtainable from any chemist, costing, say, about fourteen annas or one rupee. The soap is strong and powerful in its action; so it is not meant for use on face or tender skin parts. This soap should be used, (as per directions enclosed in the tin box), for itch. One cake of soap should easily last one year. Another soap that can be recommended and which will be found very effective is Grimault's skin soap. Full directions are given with this peculiarly red coloured soap and some report it as extremely efficacious. The price is about Rs. 1-8-0 per cake.

Zinc oxide and Boric in powder form or in ointment form (sold in collapsible capsules) should be kept to apply to small thin wounds or cuts after shaving or scratches from other sources. These powders or ointments are sold in small quantities at two annas a packet.

Potassium Permanganate should be also kept in small quantities (which can be obtained in two annas or four annas packets). One speck of this in half a bottle full of water forms a fairly good disinfecting solution. Well-known firms sell small cases, one end of which contains a tiny lancet and the other end forms a receptacle for a little Potassium Permanganate. This may be kept in one's pocket as a protection against snake bites. Printed instructions are furnished with these tiny cases, which the writer purchased sometime ago from Messrs. Whiteaway and Laidlaw for distribution amongst this staff.

NO. 5. A COOL SYSTEM.

The beneficial effects of castor oil used, say, once a month, are well-known, but owing to its unpleasant odour and taste, very few people take it. During the *hot* weather, those working in the *malnads*, the writer recommends the use an aperient well-known as "Eno's Fruit salt". Full instructions are given as to the quantity to be taken, etc. In hot weather, thrice a week,

one tea-spoon should be dissolved in a little water and taken. The beverage is most refreshing, tastes like soda water, and has an excellent action on the liver. The price is Rs. 2-12-0 a bottle which should last for three months at least.

NO. 6. BOILED WATER.

The writer has no patience for those men, who make it a boast to say "Oh! I don't bother about boiled water you know, it doesn't hurt me". In the full force of youth the effect of drinking unboiled water may not be felt, but sooner or later, the person is bound to pay for his rashness. Unboiled water in a country like India, the climate of which is suited for the breeding of germs, is a great danger. Sometimes, I have heard the remark "Oh! This water is from a well, no need of boiling it". The writer challenges that statement by the incident. An officer of a very high standing was once seated outside on the verandah of a travellers' bungalow. In the compound there was a well, and in front of the well, a woman—some relation of the bungalow maity—was washing clothes such as saris, etc. After pounding them for a little while, she tied all the clothes to the tail end of a rope and then before the officer knew what was happening, she lowered all the clothes into the well to give them a final rinsing bath! No need of the writer to add here that the gentleman did kick up a tremendous row. Another gentleman told me that, in many cases, people bring their metal pots and pans rubbed with earth and ashes, and then dip them into the well to clean them up finally. Is this a labour saving device?

The writer can give dozens of incidents like this, but let this suffice to point out the necessity of boiling water taken from even a well, looking so clean and harmless, due to a nice white "protective" stone parapet wall surrounding the well. Boil the water and strain it through a clean handkerchief and drink plenty of that. While talking about boiled water, may the

writer speak a few words on this subject? In a certain part of Shimoga District, he found one of his sub-overseers laid up with fever. He sent for a senior sub-overseer and this is the conversation that took place.

"What is the matter with sub-overseer R"?

"Sir, he is laid up with fever since yesterday and feels very weak".

"I see, have you given him any light nourishment, kanji or anything like that"?

"Yes, sir, we gave him a little kanji in the morning, and at 11 o'clock we gave a bottle of soda but he vomitted it soon after".

"Yes, but where did you get the soda from?"

"Locally made, sir".

"Have you a spare bottle? If so bring me one please".

The spare and much valued soda water bottle was duly brought, opened, and the contents smelt and tasted by the writer. The writer gives his assurance that had he drunk that soda, in spite of the fact that he felt very fit, he would have become seriously ill with nausea, so repulsive was the taste and smell. Alas! what is one to do, but then
Yes, let us pass on.

NO. 7. MILK.

The men working under the writer have had sometimes to work in parts where milk was extremely difficult to get, and what quantity they got was too small and very poor in quality. As stated before, subordinates in *malnad* got an enhanced rate of allowance and they should understand that they must make use of this *now and then* to combat difficulties in the *malnad*. The writer obtained of his men several small tins of what is known as "ideal milk". This is the purest of rich milk tinned by machinery. It is sold by all leading provision firms. It must be added that it is different from what is known as condensed

milk, for in this case it is pure milk. Each small tin containing about a cupful and costs now-a-days, due to war, seven annas. This has to be diluted with two cupfuls of water, boiled and kept. Full instructions are given with each tin.

However, the writer had better describe, how to get the milk out of the tin. Here again one must be clean. Obtain a clean nail, and puncture two small holes just near the circumference, but one at each end of a diameter. One hole is for the milk to come out and the other is for the air to go in! Empty the milk in a clean jug or cup and always keep the milk (concentrated or diluted) in a cool place. The best plan is to keep the jug half-immersed in a large vessel containing cool water, and cover the whole thing with a clean piece of cloth to keep the flies away. A fly is another terror and sometimes the destroyer of human life.

No. 8. MALARIA.

The writer has no desire to make the paper a lengthy one; so he will close the subject by saying a few words on the most important subject of malaria. He wonders how many readers understand the meaning of the word "prophylactic" or "prophylaxis." Many know, have heard, and may have experienced for themselves inoculation against plague, small pox, typhoid, etc. What is the object and action of inoculation? To put it in simple language it may be described as follows:—Let us imagine a colony of industrial human citizens working peacefully towards prosperity, but without any organization against hostile attacks from some other totally different community. When the attack comes, the citizens, however industrious and willing they may be in other paths of life, will be hopelessly outmatched and there can be only two issues to this, *viz.*, (1) either the colony will make a terrible effort to organize and drive the foe back, costing enormous sacrifices, or (2) succumb to the onslaught. But had the

citizens (even amidst their usual work) been trained and taught in their spare time to instantly organize themselves at the signal of alarm, what then? Well, then, the story would be different. Automatically companies would be formed, positions would be held, and the enemy would be worsted. Similiar are the conditions for a human body. Train the life corpuscles of the body to resist attacks. How can that be accomplished? The answer is, by introducing or giving (call it whatever you will) the system something (arms, ammunition, fighting materials and equipment) that enables it to ward off the attack of malaria, the moment the parasites begin to get an upper hand in the blood. This measure then, of training the cells of the body to fight against invading germs, is known as "prophylaxis."

Now what is this wonderful remedy which should be introduced into the body? The answer is quinine. The writer is sure that this reply is disappointing to many; they expected some wierd and long-winded chemical name, but do not be impatient, read further. How many times has the writer during his sojourns come across men suffering with malaria and the following is a typical bit of conversation: "Hollo! you are not well". "Yes, sir, I have fever since yesterday morning". "Well, have you taken any medicine"? "Yes, sir, I took some quinine this morning". Every time the writer hears that he heaves a sigh and mentally murmurs. "Now what are we to do," and then starts lecturing to (if the patient is intelligent enough) him on the prophylactic action of quinine.

To be brief, spasmodic treatment of quinine is absolutely no good. Probably due to any or all of the forementioned causes the body has been weakened. On the top of that to ask the body with the aid of quinine to drive off the enemy (malarial germs) after they have already commenced the havoc, is to ask for a miracle.

The correct treatment may be summarised as follows:—Immediately on entering malarial tracts, a dose of ten grains should be taken. This will cause what is known as singing in the ears, but don't worry over that. After that, every seventh day, a eight to ten grains dose as regular as clockwork, or a four to five grains dose twice a week, although at the time of taking, the person may be on the best of health.

Everyone interested in this should try and read a small pamphlet of eight pages published by the Government of India, Central Branch Press at Simla, and written by Lieut. Col. G. F. W. Braide, I. M. S., called "Malaria in the Punjab," from which the writer has given below a few extracts.

"The method adopted has been the administration of fifteen grains of the sulphate of quinine in solution every seventh day. This may not be the best way to give the drug; authorities differ on the subject, but the administration of a single dose on a particular day of the week has practical advantages in a prison. It has proved successful clinically, and Lieutenant Colonel Adie, I. M. S., assures me that he has failed to find the parasites of malaria in the blood of prisoners getting this dose even when they were exhibiting the symptoms of a malarial attack. What is absolutely essential is, that whatever dose it is decided to use, should be taken systematically on specified days throughout the months of August, September, October and November. If immunity is secured during that period there is little danger of malarial infection in the Punjab during the eight remaining months of the year."

"Every medical officer in the Punjab now ascribes to quinine prophylaxis the immunity recently enjoyed; and the experience of the past year has converted many doubters. The Civil Surgeon of Hissar writes: "I was somewhat sceptical as to the value of quinine as a prophylactic without the use of mosquito nets as

protectors. The results of last year's experience, however, converted me absolutely as to the prophylactic value of large periodical doses of quinine, and I determined that in 1908 I would give the drug a fair and impartial trial, and the result as shown above has exceeded my utmost expectations." (In Hissar district the fever death rate was 46.15, in Hissar town it was 21.02 per 1,000; in Hissar jail the total death rate was 7.04 per 1,000, and only one man was treated on account of malarial fever)."

"In the Hissar jail, on the other hand, a ten grain dose of quinine was given throughout the year to every prisoner of his admission to prison, and fifteen grains every seventh day during the autumn, with the result already noted, that there was only one case of ague recorded during the twelve months. I personally investigated this record and could not shake it. Its importance lies in the fact that it brings out in the clearest manner the most important deduction that if a man takes quinine systematically he is practically malaria proof; antilarval measures, mosquito nets and other remedies are alike unnecessary, he may suffer or die from any of the ills the flesh is heir to, but he is not likely to be attacked by malaria or to suffer from its sequel."

The writer knows of one sub-overseer who actually thought that certain quinine pills which the writer possessed and had administered to him, were far more effective and medicinal in some mysterious way than the simple pale pink coloured quinine tablets supplied by the Malnad Improvement Department or the extremely cheap packets (containing quinine in white powder form) of which every Post Office has a stock. Truly, puzzling sometimes are the ways of human mind. After looking into the matter carefully, the writer found that the pretty sugar and gelatine coatings of the pills he had given, had caught the eyes of the patient, thus causing an utterly false

comparative impression. Let such impressions be banished. Rather the case is reverse. The pretty white sugar or gelatine coating, in fact, retards, and sometimes utterly prevents, the quinine pill being completely dissolved in the inside. There is nothing like quinine taken in solution form, but the taste is bitter and hence devotees are less. There is no royal road to malaria free kingdom.

I have heard some people say that quinine may be all right but it gives them a tendency to headache, etc. The reply to that is to ask them to choose the lesser evil. For the benefit of those who wish to know, the writer begs to add that there are other excellent preparations on the market, *viz.*, Squibb's ague specific, Esanofele, etc., which may be tried by those who have already got malaria in them.

Attention to the above suggestions, regular moderate meals and regular hours will certainly conduce to great bodily healthiness. The writer himself has had some bad bouts with fever in malarial districts, but in each case, on carefully thinking over, he traced it to exposure to sun or neglecting the use of quinine.

The sub-overseer in the ordinary tracts gets as allowance (excluding his pay) Rs. 15/- per month and in the *malnad* tracts Rs. 30/- per month. A maistry with superior qualifications could ask for three-fifths of his daily rate of pay whenever he has been outside five miles radius of his head-quarters in the *malnad* tracts; that is to say, if a maistry drawing thirty rupees a month has been ten days out of his head-quarters, he may be permitted to draw (under certain conditions,) an allowance equal to $10 \times 1 \times \frac{3}{5} = 6$ rupees. The remedies pointed out by the writer are not very expensive and if once bought should last for a long time. Malnad Improvement Officers will give quinine free to deserving cases. The writer sincerely hopes that the few suggestions he has ventured to make will prove of some interest and use.

POSSIBILITIES OF THE EASTERN PORTION OF CHITALDRUG DISTRICT.

BY M. RAMA RAO, B.A., B.L.

THE arid district of Chitaldrug has yet certain advantages over its sister districts. The scanty rainfall and the uncertain distribution during the year makes the people careful in conserving the few drops that the Gods may grant. Long before a speck of cloud darkens the sky, we find the ryot carefully tilling the black soil unmindful of the blazing sun above. The important consideration is that not a drop of water should be allowed to run to waste and personal comfort is not considered. Thus we find bumper crops though the rainfall may be as low as sixteen inches per annum. In fact, it is quite common in Chellakere to have only this quantity of rain and yet the taluk has been one of the best in the district. As the Meteorologist of Mysore remarked, the country which has low rainfall is not subject to famine as the people are careful and can manage on scanty rainfall.

The black cotton soil in the district is very rich and cotton crop has been above the average for three years past. The high price of the commodity has put large sums of money in the hands of the cultivator and the district has increased in prosperity on all sides.

But it must be admitted that agricultural life alone is insufficient to meet the needs of the community. Davanagere is no doubt an industrial town and has made great strides as a commercial centre. Being nearer Bombay, it has certain unique advantages over the other cities in the State and its enterprising citizens may well be trusted to develop it to its full. Cotton gins, oil presses and other mills are already changing the appearance of the town and there is every likelihood of a cotton mill and soap

manufactory being started in the near future. But there are certain natural products in the western taluks of Chitaldrug which well deserve the attention of capitalists and enterprising promoters.

We may first of all mention the great Marikanave Lake which had until recently the largest storage capacity of any artificial lake in India and was second only to the Nile Reservoir at Assuan. The depth of water is 110 feet with a water spread of thirty-four square miles and the capacity of the tank is thirty thousand million cubic feet. The quantity of water-power available under the tank would be sufficient to start a hundred industries and we may add that sluices have already been constructed for generating electricity should a demand arise. There is thus a great initial advantage for starting new manufactures.

The agricultural needs of this tract also render imperative the starting of a few industries if agriculture is to become successful. Bone meals has been acknowledged as one of the best manures but cannot now be used as no plant is available for treating and crushing the crude bone. Oil cake has now to be imported in large quantities for use on the wet fields under Marikanave. If an oil press could be started, the export of oil seeds would cease and the freight on the seed and in reimporting the cake would be saved.

The earth from Hosadurga taluk has been found suitable for the manufacture of paints and a thriving industry has been started in Bangalore. If the local capitalists could attract the industry here, it would economise the cost of transport of raw material.

The pyrites crystals are in abundance in the hills to the south of Hiriya; and considering the large quantity of sulphur and sulphuric acid which may be extracted from this ore and proximity to the water-power, a factory for sulphuric acid may be a business proposition.

The Geological Department has located certain stone quarries, the output of which appears to be as good as Cuddapa slabs. The Deputy Commissioner has taken up this question with great enthusiasm and quarrying on a business scale is expected to begin soon.

Soda and salt efflorescence is met with in Hosadurga, Hiriya, and Chellakere.

Soda was being manufactured in several places in Hosadurga taluk and used for the manufacture of crude glass. This has now stopped for want of fuel and even crude glass has to be imported from Amritsar. A revival of this industry on modern lines will be a paying proposition.

Salt is now manufactured in Chellakere and Hiriya and there are more than three hundred pans in these taluks. The method adopted is crude. Efflorescent earth is collected and put into the pan on top of a mould and water poured on it. The salt in the contents is dissolved and trickles down a pipe to the tank at the foot. The solution is dried in mortar basins and forms in small crystals. This description shows that the manufacture can only take place in summer and has to be suspended during the rainy season. The capital of the worker is very small and he cannot take advantage of summer sufficiently. Even with all these drawbacks, earth salt is still a paying commodity and has a large demand for tanning purposes, where it is considered superior to sea salt. If scientific methods are introduced and sufficient capital and enterprise be forthcoming, there is no question that a large industry may be built up here. The salt has undoubtedly admixtures of various allied salts and, as in the salt mines of Austria, a careful analysis will show that valuable salts may be separated from the crude salt now prepared.

We may add, in conclusion, that the Forest Department has to a certain extent solved the fuel difficulty by encouraging charcoal manufacture in Bommagondankere forest which is about twenty miles from Chellakere. The charcoal thus produced is sold in Bellary, fifty miles away, and is found much cheaper than jungle wood. The question of changing the wasteful method of charcoal manufacture and replacing it by wood distillation is also engaging the attention of the Forest Department and, if this scheme is adopted, a number of subsidiary industries can no doubt be started. Transport difficulties will soon be solved as the survey for connecting Tumkur with Hiriya and Chitaldrug by railway has been completed, and a line is under construction from Chitaldrug to Chickajur. We invite the attention of capitalists to this rich tract of country.

A PHASE OF INDIAN INDUSTRIAL DEVELOPMENT.

BY R. K. SANGAMESWARA, M. A.

THE present deplorable condition of Indian industries, and the ways and means for the encouragement and improvement of the existing ones, and the founding and fostering of new ones are engaging the constant attention of all thoughtful Indians both in British India and in the Native States. At this juncture, it might almost appear idle and useless to speculate upon the line of progress that is likely to be followed by India in her industrial evolution in the future. However pessimistic one might be at the sight of our helplessness at present, one cannot but be aware of a few sparks of light, that clear the gloom. There are certain living forces at work, which have got all the potential energies of the future stored in them, and which are moulding the future industrial era as definitely as the forces that evolve the child into the man.

The first great adventures of the Tatas, and their recent rapid successes and advancements, are one of the most satisfactory signs of the future. The founding of the Iron Works, followed by the Electric Scheme, were both business enterprises of the first magnitude in our country; and both of them by themselves would have been pronounced as landmarks in the industrial progress of India. Their successful pioneer work, followed by fresh undertakings, especially in the last few months, have been watched with the greatest satisfaction throughout the country, as an augury for bright days to come. But their significance lies deeper, and may escape the eyes of a superficial observer. The rapid strides taken by this firm will not merely be found on a careful

examination of facts, as necessary steps in the evolution of our industries, but may also be perceived as the first few links in a great chain of industrial development. In order to understand the vital force which enables the Tatas to build up their industries in rapid succession, we should examine the question in the light of American industrial progress.

The essential feature of the American industrial system, is the existence of the so called "Trust." It may be briefly described, as a concentration and combination of capital, within a trade,—got up by amalgamation or by buying up of weaker ones—large and strong enough to control almost the entire supply and selling price of the article it deals with. These methods of combination have been mainly followed up for the dual purpose of securing economies of production, and for putting down "cut-throat" competition; and often also, with a view to secure substantial powers of monopoly. The most conspicuous examples of such Trusts are, "The Standard Oil Trust," "The United States Steel Corporation," and "The Anthracite Coal Trust." A fair idea of the power and the sphere of influence wielded by these colossal business enterprises, are best illustrated by the aims and objects named in a clause of the charter of the United States Steel Corporation, which reads as follows:—"To construct bridges, ships, boats, engines, cars, and other equipment, railroads, docks, ships, elevators, waterworks, gasworks, and electric works, viaducts, canals and other waterways, and any other means of transportation....."—all these being only *subsidiary* to the final object, for the manufacture of various commodities of which *steel* is the principal product.

Our aim in this article is not so much to examine the nature and constitution of these Trusts, as to study their effect upon, and the role they have played, in the evolution of the American industrial system.

The great American capitalists did not rest contented with the establishment and organization of these gigantic business enterprises; for they soon realised that their industrial position was unassailable, neither in their own country nor outside it. They found that their industrial stronghold could be made impregnable, as it were, only by siezing the powers of transportation and finance. For the railways and waterways are the only effective highroads for the distribution of manufactured articles; and 'credit' is the motive force of modern business life and therefore that class that controls it, becomes more and more powerful and "secures a large profit out of the products of industry." In other words, business enterprises and banking, insurance and other financial enterprises, are closely linked together.

A careful review of the lines and careers of powerful American financiers, discloses three important leading strings of power in their hands, *viz.*, Industrial Trusts, Railroads, and Banking. Often, these three important economic functions are even found to be united in one and the same hand; and this merging together of these three forces has been appropriately termed the "triangle of financial forces." External economic necessities drive the American magnates into taking possession of these three allied functions; while internal conveniences seldom fail to help and smoothen the way for the appropriation of the same. The various steps in the ultimate domination work out as follows:—

The profitable career of an industrial trust is principally due to the regulation of output, which in its turn puts a limit to the capital outlay. "It is thus impossible *ex hypothesi*, for a trust-maker to find full continuous employment for the high profits he makes, by extending the plant and working capital of his own business; such a policy would evidently be suicidal. He must look outside his own business, or

fields of profitable investments for his profits. If he occupies himself, as sometimes he does, in organizing other industrial trusts in businesses related to his own, his success yields *new* profits, which must seek employment further afield." * After the assimilation of several allied industries, the next step, naturally, is the appropriation of the banking function, and the facilities of transportation, the co-ordination of which is so essential for the advantageous maintenance of the original business enterprises. Therefore it is that an interchange takes place resulting in Trust-makers and Railway kings, like Rockfeller and Gould becoming directors of banking and insurance companies, while bankers like Morgan turning industrialists. The following table illustrates these lateral business affiliations:—

	Banks, Insurance, etc.	Trusts	Railways	Manufactures	Telegraphs	Total (including miscellaneous)
Morgan J. P.	3	...	22	2	2	33
Rockfeller, W.	7	1	9	11	...	28
Stillman, J.	18	6	12	6	1	48
Gould.	4	1	23	...	9	42
Deplw.	5	4	53	2	1	67

The actual process of such a formation may best be appreciated, by the consideration of the working of the Great Standard Oil Trust, for example. This huge Trust, for some time past, yielded dividends averaging \$ 45,000,000 (Rs. 12,00,00,000) (?) a year or 50 per cent nearly on its capitalisation. Probably a third of it goes directly into the hands of Rockfeller, and nearly as much as 90 per cent, into the hands of the small controlling group of which he is the chief; while the small amount of 10 per cent is alone, probably, diffused among the masses

* Hobson : *Evolution of Modern Capitalism*.

of common shareholders. "Consider what must be done with the greater part of this 45,000,000 dollars. It *must* be invested. The oil business does not demand it. There is plenty of reserve for all its ventures. It must go into other industries. Naturally the interest sought will be allied to oil. They will be railroads, banking, etc."*

Thus the process of expansion and consolidation proceeds apace, over all those industrial fields, where capitalistic methods of production prevail. These larger and larger masses of profits, that are annually earned, first saturate all the 'trusted industries,' and then invade the regions of transportation and general finance, till they find no more room for profitable investment in their own country. When this stage is reached the capital must naturally go out of the country, in search of foreign exploitation. That this stage was reached, long ago, by the United States is evidenced by the Spanish War and the annexation of the Phillippines, the Panama policy, the 'new application of the Munroe doctrine' to the South American States and China as a field of railway enterprise and so on. This ever growing field for fresh investments of the huge annual surplus profits is the great crux of the financial system of America, which threatens to dominate the future economics and politics of that Great Republic. With this last phase of their activity we are not concerned; and it has been given, solely to indicate the nature of evolution of American industries, whose crowning triumph has been the domination of the American magnates over American politics.

The above brief account of the evolution of American Trusts clearly shows, how the ever swelling current of annual profits, concentrated in a few hands, enables the trust-makers to inflate their own industrial structures, and afterwards, invade the sister

regions of transportation and finance. It is this phase of their activity that furnishes the basic clue for explaining the progressive activity of the Tata Companies. In the utilisation of the ever-increasing surplus profits, for further industrial expansion, lies their closest resemblance to the American Trusts, while from many other points of view the parallel may not hold good, or even found to be altogether absent. The trusts attained their triumph, after a continual struggle through 'competition' with their rivals, in the same trade, whom they ultimately defeated and ruined, or incorporated in themselves. Again, in the building up of these huge industrial structures, they have been backed up by a high tariff wall, to shield them from outside competition, so that their prosperity was built up greatly at the expense of their rivals and the 'consuming' public, who were weighed down by high prices. Further, the prevalence of private ownership of railways in America, enabled them to assume the control of the trifle financial forces, and so helped them to attain to a more and more monopolistic condition in their respective trades. These and several other factors might have worked in union to lift the young trusts to their unique position of securing enormous 'monopoly' profits.

Similar factors, of an identical nature, may not have contributed to the elevation of the Tatas, to their unassurable industrial position; and a close comparison with the Trusts may not be perceived. The causes, which contributed their share to the healthy growth of the Trusts, were peculiar to their own country; while a different variety of causes has worked up here to gain the same end; so that the net result attained by both, through their own peculiar environments is the same. The Tata Iron and Electric Works need not shrink from 'competition'; for they have none to fear. Nor is there need for them to effect 'combination' or other arrangements for regulation

* Miss Torhell: *History of the Standard Oil Trust.*

of output and for a minimum selling price; for regulated output in their Iron Works, is almost guaranteed by the wholesale contracts with the government and the several Indian Railways. Tariff protection, again, from outside competition is still less required; for the war itself has been acting as a very high tariff, helping them directly and indirectly. Thus the Tata Iron and Electric Companies, on account of their unique position, are in the nature of monopolies and, therefore, capable of earning 'monopoly profits', as substantially, and successfully, as any great American Trust. So that we see that the Tatas are essentially of the nature of trusts; and their individual position is probably, even more enviable, for the reason, they have won it with less struggle.

The above analysis shows that we should expect the Tatas to work up a number of industrial enterprises based upon the stable fulcrum of recurring surplus profits. It would be an instructive study to have an idea of the amount of profits earned by the Tata Companies for the past few years, and to estimate the percentage of the total profits, that passes directly into the hands of Tata Brothers and, therefore, ready for further investment, further afield [*e.g.*, Standrad Oil Trust, p. 5]. That they have arrived at such an advantageous stage, after providing for all expansion and emergency, in their original industries, is more than indicated by their recent announcements to establish the cocoanut industry and the shipbuilding trade. Within the last month, again, we hear them announce the starting of Electro-chemical Industries in Bombay and several 'advantageous' industries in the Nizam's Dominions, backed up by special privileges. These successive achievements have given universal satisfaction in our present pitiable industrial position; and they are even viewed by many with wonder and surprise. But when they are examined, in the light of our discussion, it will be found, that they are not surprising at all but are

only to be expected as a natural result of the forces at work.

Their founding the Industrial Bank, however, though in the chain of events, requires a more detailed examination.

As soon as business enterprises are established on a sufficiently broad basis, there arises the necessity for an 'enlarged credit' in their business transactions. "This credit, however, will be not merely drawn from the investing public, in the form of subscription to its stocks and bonds, but the capital thus created will be a basis for a more elastic sort of credit required in the actual working of a modern business." In other words, it should have recourse to bank credit "using its actual capital, visible and invisible, as collateral security, upon which to obtain the use of a far larger amount of credit".

Usually, in all countries, industrialists secure this 'credit', either by associating themselves with powerful banking houses already in existence, or by the creation of new ones to suit their own special conditions. But in our country the banking machinery is rather complicated; its several functions are partly or wholly controlled either by the government itself or by the European banking houses. The vested interests of the latter are often found in alliance with powerful commercial interests. Therefore, much help and co-operation cannot be obtained from them advantageously, to secure the progress of a competing indigenous industry, which often, therefore, finds itself isolated financially. The result is that a rising industrialist here, must be either powerful enough to establish banking facilities independently for himself or be crippled altogether. So that, when the time came, powerful as the Tatas are, they have successfully launched an Industrial Bank, as the next essential step, to mark their progressive career.

Having thus effectively secured the combination of a number of flourishing industries,

under the sphere of influence of a powerful bank, it is thus reasonable to expect the Tatas, to work up a great many industrial enterprises "latitudinally and longitudinally", all of which would then form appendages round the central cluster. It is not improbable, that a time may come, in the near future, when in addition to their numerous factories, and coalfields, and technological institutes, they may own their own railroads, shipyards and shipping companies. When this stage is reached then would, even the most conservative mind be convinced, that the Tata Companies had in them the germs of the towering industries of America.

The aim of this article is not to prove that the line of Indian industrial progress will be purely, through industrial organizations, of the Tata type. There are possibilities of various other forms of development. For instance, Indian States like Mysore may develop their own industrial webs, of a quasi-government nature; or again, the British Government itself may also begin to be the pioneers of industrial life in certain spheres. Whatever be the forces that may mould the industrial evolution of India, the type of development that has been discussed, however much it may vary with local conditions, is likely to play a great part.

Therefore, if it be asked, will the Tatas be the only towering figure in future Industrial India, or will they be one of a galaxy of industrial giants, the answer must be in the affirmative, although the future formations are only in a nebulous state. Is it not possible to conceive a combination of the cotton industries of Bombay or the jute of Bengal, as furnishing the nuclei for the birth of new organizations on a huge scale? Pessimism will enter the minds of only those that believe in evolution as a continuous growth, from one point of progress to another, to reach the highest stage. But careful observation shows that an advanced society, might, as well, jump over a number of

intermediate steps, to reach the final goal; and pessimists who still persist in their belief in continuity in evolution, will be obliged to arrive at the above conclusion, that to drive a modern locomotive one should begin with the Rocket of Stevenson.

From the above discussion some facts of very great practical importance suggest themselves for the shaping of the economic policy of this State. The State has fully recognised the importance of developing economical activities by starting industries in various fields. This they have been obliged to do, as a result of want of private initiative, in floating industrial concerns and their inability to secure adequate financial assistance, expert knowledge, and so on. Under these conditions the best method has been, of course, for the State to come forward to answer the industrial call. But its policy should be to create sufficient interest and confidence in the public, to enable them to start industrial concerns of their own, in future, not only by actually exhibiting a number of successful business enterprises (which may serve as models), but also by giving to the public, opportunity for subscribing a portion of the capital in each industrial undertaking. Also the annual profits, which the State realises in its industrial enterprises, should, on no account, be seen in the light of public revenue to meet a portion of the annual expenditure of the State; but they should be left 'earmarked,' as capital, for investment in future undertakings, thus enabling to maintain a progressive policy in industrial development.

Quebec heads all Canadian Provinces in pulp and paper making. In 1916, 924,000 cords of pulp wood were cut by Quebec workmen, and this huge log pile was worth almost \$7,000,000. Ontario came 'second' with 637,000 cords cut.

THE MYSORE TANKS.

BY E. A. BURROWS,

Tile Expert, Mysore State.

IT is advisable for all Mysoreans in these days to remember the debt which they owe to their progenitors for the magnificent heritage which they left in the shape of the numerous tanks for the storage of water, to water their crops and to provide against the certainty of famine and drought, without the benefit from these tanks.

The first idea that strikes one after seeing these beautiful tanks is the enormous amount of labour and money unstintingly expended on their construction, some tanks of which are miles in area, and designed to hold large volumes of water in conjunction with the monsoon showers, the farmers and agriculturalists are provided for as far as is humanly possible against drought and famine. But after seeing more of these tanks and on closer observation we find that things are not what they seem, nor are these tanks in anything like the same condition of usefulness for which they were designed and if the builders of these tanks could return to this life again and inspect their former handiwork I am sure that they would stand aghast at their deterioration. In fact, I think it is safe to say that many of these tanks have already lost the greater part of their usefulness, many of them being merely hollow shells of their former glory.

As Tile Expert to the Mysore Government it has been my privilege to visit very many of these tanks, and the result of my examination of these tanks is that, in my opinion, the average tank in Mysore has already lost 50 to 75 per cent of its former usefulness. I refer, of course, to the silting up of these tanks.

The silting up of these tanks is such a gradual process that it is apt to escape observation of many people excepting, per-

haps, the cultivator who annually draws less and less water from them. In monsoon weather, all these tanks appear to be full to the brim, but what a difference even one month afterwards, the bottom of the tank appears and the water has vanished, and we are now able to see that the tanks are very little lower than the remainder of the country, and the water which the tank contained in the monsoon period was merely a shallow sheet without depth. In very many other cases it is difficult to find out where the tank extended to formerly, as it is all filled up and grown over with grass and vegetation.

The question for us to consider is:—Are we to blame for this deplorable state of affairs? Are we to allow this heritage to waste away to extinction? Are we less energetic and progressive than in former days? Or worse still are we to allow these natural forces to continue their destructive work, and these tanks, finally to disappear, leaving us face to face with reduced harvests and possible famine? I am sure that none of us would agree to this policy of inaction and extinction; therefore, we must seriously consider and adopt any remedies left open to us, if any.

Also we must recognise that the construction of these tanks and their maintenance is against the forces of nature. The action of nature is silently and irresistibly to fill up the lower levels, and to wash the hills down into the hollows, thereby levelling up the tanks. Therefore, we must recognise that any remedies proposed will have to be continual remedies acting against natural forces. These natural forces have been and are even now very much under estimated, and any remedies which may be undertaken will require to be over estimated; otherwise, this state of things will continue, and may even grow worse.

The usual remedy adopted by Government in the past when a tank silts up, is to spend a considerable sum of money in raising the

bunds around the tank, to contain more water but I am of opinion that this remedy is worse than the disease, being waste of money, as this raising of the bunds at its best puts off the evil day a little longer, but does not stop the deposition of silt, and has other disadvantages.

On the other hand, it is a very easy and universal failing to expect the Government to remedy this and other evils. But I should prefer to remember the old proverb, "A grain of self-help is worth an ounce of pity," and I trust that the remedies which I propose, contain at least the proverbial grain of self-help.

The first remedy I propose I will touch very lightly as this remedy is an agricultural remedy, and I would prefer to leave it for the Agricultural Expert to treat in detail.

The washing of the silt into the tanks is distinctly a selective process by nature, only the selected and best portions of the surrounding country are washed down, and carried and dissolved by the water. The material washed from the hills and higher ground into the tanks chiefly consist of loam, fine sand, fine clay held in suspension by water and finally deposited on the tank bed, also various minerals such as Iron, Lime, Magnesia, Silica, Alkalies, Potash, Soda and humus. It will be easily recognised that tank clays containing some of these minerals are extremely valuable to the agriculturalist as a cheap form of manure, readily and locally available at the cost of carting clay and humic soils are especially valuable to the farmer. They have many advantages. Clayey soils retain the moisture well; clayey soils also absorb moisture from the air, whereas sandy soils are non-absorbive. The ability of soil to raise water from below by capillary attraction is important. Clay and humic soils are best for this purpose.

From these remarks it will be seen that it will pay the agriculturist to manure his ground with the local tank clays which are

ready to his hand, by the usual method, or by mixing farm manure together with it and ploughing it in, or by a method much used in England, *viz.*, burning the tank clay lightly with leaves, brushwood, etc., and then adding the lightly burnt clay to the ground. It will also pay the Mysore Government to give free concession to all local agriculturalists to remove tank silt at their convenience and by this means a real remedy will operate to stop the silting up of the tanks.

The above remedy of itself is not sufficient to empty the tanks of silt, but I propose a second and even a third remedy to create a large demand for tank silt.

At the present time the only persons who use the tank clays, besides the agriculturalists, are the potters. The potters are doing good work but the quantity they use is negligible, and has no effect on reducing the deposition of silt in the tanks.

For the second remedy we must look to the Indian brickmaker to create a demand for a large quantity of tank clays and loam. At present, the bricks manufactured by the Indian brickmaker are a disgrace to his trade, a good hand-made brick as made in England and Europe will stand a compressive strain of fifteen to twenty-five tons on each brick (size $9+4\frac{1}{2}+3$); whereas the average Indian hand-made brick, will not stand one ton pressure and in many cases can be crushed underfoot. Brickmaking in India is as bad as ever it can be, hand-made bricks equal to English hand-made can easily have been made by Indian brickmakers, under European supervision. On the West Coast we have manufactured hand-made bricks capable of resisting a crushing strain of fifteen tons on each brick and I have built tall chimneys with them even to 150 feet high above ground level, but the local brickmakers had to scrap their Indian methods and use English methods.

In the first place, they must get their clay from the local tanks, the mixture to contain

not less than 25 per cent of clay. At present they manufacture the bricks from any piece of earth which contains from 2 to 5 per cent of clay, and they dry this almost exclusively sand mixture, out in the open heat of the sun; the resulting bricks are rotten.

They must use a mixture containing more clay and dry this mixture under cover of sheds or lue boards, to prevent them from cracking. No good strong brick clay will ever dry out in the sun without some protection from the heat of the sun and wind but once a good brick clay is dried in a reasonable manner it will burn well, and ring like a bell and be weather-proof.

The Indian brickmaker must also scrap his native kiln and use the English or Scotch pattern. The kiln which he now uses is theoretically wrong and out of date. At present he places both bricks and logs of firewood together, shuts it up and allows it to burn itself and take its chance; the result is that the bricks are never properly burnt or vitrified and fuel is wasted, and the bricks when finished are soft, whereas if made of good clay and burnt in a simple English kiln in which the firewood is burnt in separate furnaces, so that the goods all become bright red hot, and the skill of the burner is used to advantage, the resulting bricks will be perfect.

The part the Government should insist on with regard to contractors, builders and brickmakers, is that usually undertaken by Government in all English towns and municipalities, *viz.*, the Government strictly insist that all bricks which cannot resist a crushing strain of ten tons on each brick should be condemned and not allowed to be used. This is not an excessive strain. Machine-cut bricks can now be obtained from the tile factories which can resist a crushing strain of thirty to forty tons on each brick.

If such a test is insisted on by Government enormous advantages will accrue to all concerned, even the brickmaker himself.

1. The brickmaker will be obliged to take all his clays from the outer circumference of the tanks and thus do his share to empty the tanks as brickmaking clay of the right strength is usually found on the outside portion of most tanks.
2. Brickmaking will become a skilled trade worthy of the name. The cost for covering the unburnt bricks from the sun is not excessive and the change of kilns from the present native kiln to the English or Scotch pattern is very little more than the present cost, and the better quality of bricks will demand a higher price and repay the brickmaker handsomely.
3. The builder will get the best advantage his walls being built of permanent, weight-resisting, weather-proof bricks, neat and strong. He will not require to use walls so thick. He can use 50 per cent less bricks, neither will he require lime plastering to cover his brickwork, good bricks being more weather-proof than the best lime plastering.
4. The public will also reap the benefit of living in imperishable durable weather-proof houses, artistic, dry and healthy.
5. The Government will reap the benefit that the tanks are being kept clear of silt without any expenditure, by allowing the brickmakers free use of the clay in the tanks.

The third remedy which I propose, is practicable in a good many tanks, but not in all. About 75 to 90 per cent of the tanks contain clay useful for brickmaking, but only about 35 to 50 per cent of the tanks contain clay suitable for the manufacture of Mangalore and interlocking tiles in

large quantities. All the tanks in Mysore city and boundaries contain suitable clays, also tanks in the neighbourhood of Kolar town, Hunsoor, Tumkur, and many other places too numerous to mention.

At the present time Roofing Tiles are in enormous demand. Ten years ago these Mangalore tiles were manufactured and sold at Rs. 35 per thousand, on the West Coast and at Calicut and Mangalore, at a good profit. Now the demand has gone up so great that fancy prices are being demanded, from Rs. 65 to Rs. 100 per thousand, out of proportion to the cost of manufacture. But tile making cannot be undertaken by potters as it requires much capital to make a good tile factory and is a skilled operation. Almost all the clays suitable for roofing tiles belong to the tank clays or Lacushine clays, the remainder are of fluvatile origin. Therefore, it can easily be understood that a tile factory instituted on or near the region of the tanks will be an invaluable, sure, permanent remedy both to stop the silting up of the tanks and reduce the tank to its former usefulness. For this reason it would be sound business on the part of Government to encourage one tile factory on the outskirts of every tank in which the clay is found suitable for tile making, and any amount which the Government would have spent in the ordinary way to raise the bunds could be devoted to encourage factories for brickmaking and tile making and so rapidly lower the level of the tanks. A good tile factory will use from 500 to 1,000 bandy loads of clay per month.

Tile makers and brick makers can work together in the same tank and there is no fear of their interests clashing. Tile makers will take their clays from the centre of the tank, where the clays are the most plastic; and brickmakers will take their clay from the outer rings of the tanks where the clay is more suitable for brickmaking.

Now, I trust that, in the above article, I have shown three good, sound, effectual remedies for transforming the tanks into their former usefulness and I shall be glad to answer through the Director of Industries in Mysore any further information relating thereto.

ECONOMICS IN THE WEST.

Hydro-Electric Enterprise.

London, May 3, 1918.—It is not often that the West sits at the feet of the East in matters of industrial import. This, however, in a sense it did on April 18th, when Mr. Alfred Dickinson, M.I.C.E., M.I.E.E., M.I. Mech. E., read a paper at the Society of Arts on "Water-power in India" with special reference to the Tata Hydro-Electric Power installation in Bombay. That great enterprise, as we have long known, is one of the most striking examples that the modern world affords of the application of water-power to industrial needs. But until the facts given in Mr. Dickinson's paper were set out in their full significance with the professional knowledge that he commands few of the general public here realised what a really epoch making work had been accomplished by engineering skill backed by Indian capital on the rugged slopes of the Western Ghats. How this undertaking differs from the general run of hydro-electric schemes was explained in some illuminating sentences by Mr. Dickinson. "The general impression," he said, "is that water-power is the utilisation of the water of existing rivers or lakes. The Tata Hydro-Electric undertaking is not of that character; it is a scheme to provide, approximately, 100,000 water horse power from valleys which have from time immemorial been dry for nine months of the year, and where no water had previously been stored. The valleys were so dry that one of the initial difficulties in converting them into lakes was to provide water for use in building the masonry dams." A remarkable achievement, indeed, and one which could only have been carried out by men gifted with imagination—a quality which is not always associated with the work of the engineer.

Mr. Dickinson related with pardonable pride how his scheme in its initial stages was scouted as visionary by some of his professional colleagues. He was advised by them not to risk his reputation by being associated with "such a perfectly absurd engineering proposition." "Many looked upon the question, not as a serious engineering proposition but as a fairy tale." But he had faith in his ideas and ended as we know in confronting his friendly critics by the triumphant demonstration of their practicability in the completion of an undertaking which is not only a great engineering success but which, as he reminds us, "is the only electrical undertaking of magnitude which in the first year of its working has earned and paid a dividend on its full capital." Remarkable as this success is it by no means exhausts the possibilities of hydro-electrical enterprise even in the comparatively limited area touched by the scheme. As the result of investigations made at the expense of Messrs. Tata "it can now be demonstrated," Mr. Dickinson told his audience, "that by constructing a dam across a valley in the Western Ghats, water from the Koyna River can be harnessed so as to provide approximately 300,000 H. P. continuously. The preliminary estimates of cost show this scheme to be a thoroughly sound commercial proposition.

"In my opinion," Mr. Dickinson proceeded, "this is a discovery of the highest importance to the whole of the East..... When the possibility of supplying 300,000 H. P. for every hour in the year is appreciated, it will be seen that it is equivalent to supplying to industries during the normal working hours of 3,000 per annum no less than 730,000 H. P. for each and every working hour of the year. Consider the possibilities this creates. Seven hundred and thirty thousand horse power for ten hours each day for 300 days in each year supplied at, say, one-third of a penny per horse power hour. This should give to

India the greatest industrial fillip she is ever likely to receive from any single discovery."

As is well known the Tata Hydro-Electrical project has found its principal opening in the supply of power to the Cotton Mills and hundred industrial agencies of Bombay. But Mr. Dickinson in his paper showed that in the immediate future agriculture quite as much as industry is likely to profit by the application of Hydro-Electric power. This will come about by the cheap manufacture of nitrogen from the atmosphere by electrical energy. Given the appropriate local conditions it will be possible to provide on a large and profitable scale artificial fertilisers which will revolutionise the conditions of Indian Agriculture. In this connection the scheme for utilising the waters of the Periyar irrigation lake for hydro-electrical purposes is of special interest. "So far the investigations show," Mr. Dickinson says, "that a thoroughly workable and commercial scheme for the manufacture of nitrates on a large scale can be established."

GENERAL ASPECTS OF THE QUESTION.

In regard to the general aspects of the question of hydro-electrical energy Mr. Dickinson foresees a great future for enterprise through its mediumship. Its influence will, he thinks, be particularly marked in hastening and facilitating the industrial awakening of the country now in progress. That awakening is favoured, too, by the strong position occupied. "India possesses in abundance the necessary minerals for metallurgical development; the climate and land necessary for the cultivation of cotton, flax, jute, and many other commercial commodities; and a vast and intelligent population which, if properly trained, will provide skilled workers in great numbers. In addition its available capital is substantial." Although much has been done, Mr. Dickinson holds that, to use a vulgarism, her industrial possibilities have scarcely been scratched, and he broadly hints that

Western capitalists have not shown hitherto the degree of enterprise in assisting in her development which the rich prospect justified. One recommendation, which he makes and which I imagine will certainly be acted upon, is that a complete survey should be made of the possible sources of water-power in the Indian Empire. In no part of the world probably is a more promising field offered for survey. The lofty mountain ranges North and South and West with their many convenient catchment areas, the great rivers, and the numerous water-falls provide openings of an infinite kind for the energy of the hydro-electrical engineer. It is not too great a stretch of imagination, perhaps, to anticipate the time when a great proportion of the manufactures of India will be worked by hydro-electrical powers.

POTENTIALITIES OF WATER-POWER.

The possibilities of hydro-electrical power are by no means exhausted when the inland area just indicated has been fully worked. Some day, I have no doubt, a genius will arise who will harness the ocean and make it serve man's purpose. Many years ago, nearly forty I am afraid, I was intimately associated with a project which must have been one of the first of its kind for utilising the power of the sea waves. Curiously enough Bombay was the scene of this pioneer enterprise as it was of that other and greater scheme with which Mr. Dickinson dealt. The scheme to which I refer was carried out at the Back Bay Swimming Bath of which I was then Secretary. In designing the bath, which as some of my senders may know is built on the foreshore of the bay, the architect—Mr. David Gortling, C.E., a highly ingenious man so arranged the outer sea wall as to cause the waves to concentrate in a kind of angular trap and force themselves upwards through an aperture in the sluice into the bath. By this ingenious means an additional head of water was secured which was particularly valuable during neap tides. I well remember how

enthusiastic Mr. Gortling was about the potentialities of water-power in a City placed as Bombay is with the sea all round. He was laughed at by his friends, as Mr. Dickinson appears to have been, but his prescient skill will probably be vindicated before the world is very much older.

SOME SUGGESTIVE POINTS.

There are some highly interesting and suggestive points in the report just issued by the Committee appointed by the Asquith Government in July 1916, to consider the question of British Commercial policy after the war. In some directions the Committee appear to be unduly cautious. For instance, they frown upon the idea of an Imperial Bank of Industry. In their view the provision of capital is purely a matter for private enterprise. They also reject all suggestions for placing special restrictions upon the participation of aliens in commercial and industrial undertakings except in regard to pilotage and patent agencies. On fiscal questions the Committee take a moderate line. They think that the home markets should be protected against dumping by measures similar to those adopted by Canada, that preference should be given to the British overseas dominions (including of course India) in respect of any customs duties now or hereafter to be imposed, and that a strong and competent board with an independent status should be established to examine into all applications from industries for State assistance. The question of raw materials naturally receives considerable prominence. The report tells the world what it already well knew, that when the war broke out many important industries and the control of much important raw material was in German hands. This state of things, the Committee think has to a great extent been remedied since the outbreak of the war, and they are disposed in the future to rely rather upon the sustained activity and enterprise of the British manufacturer and trader than upon

any purely restrictive conditions. They further think that any attempt to make the Empire self-supporting would be neither practicable nor economically sound. Their idea is that we should pursue a "selective policy" which shall have regard to the relative importance of each commodity, whether industrial or military, the sources of supply and the likelihood of this disturbance in case of war. This procedure they consider would yield better results than might be expected from the scheme for a Development Board recommended by the Dominions Commission. On this subject as on others the well informed public will be disposed to differ with the Committee. A "selective policy" would be practically a reproduction of our old *laissez faire* system under which we suffered and are still suffering. The fact is that the Committee was too obsessed with the old Cobdenite doctrines to take a really bold line. They have evidently not realised that the pre-war policy of the British Government in economic matters is an "outworn creed." However, it is something to have got from a Committee which Mr. Asquith appointed and on which Lord Balfour of Burleigh presided an acknowledgement that dumping is an evil that must be counteracted and that preference is more than a mere pious opinion.

COMMERCIAL AND ECONOMIC STUDY.

Educational reform is just now very much in the air. In no direction is there more searching of heart than in the domain of commercial and economic study. No one is satisfied with the present state of things in which this branch of education plays in many schools a subordinate part compared with other interests and notably the classics. It is not so much that the education is deficient but that it is often poor in quality and not up-to-date. Not so very long since I picked up a geography used by a young friend of mine who was attending one of the largest and most famous of our

public schools and though it treated, or professed to treat of economic products it had from cover to cover no reference to rubber while there was no mention of Kuala Lumpur the capital of the Federated Malay States. Some approach to reform in these matters will be made if the Government adopt the proposals just made by a Committee approved by the Prime Minister to inquire into the position of modern languages in the Educational system of Great Britain. The three principal recommendations of this body are that modern studies be energetically fostered by all public and local authorities concerned with education and with public and private business, that means be taken to bring the business world into closer touch with education, and that an Advisory Committee be set up for modern studies and for scholarships. A further recommendation of some interest is that neither Latin nor Greek be compulsory for an arts degree in any of our universities. Excepting indirectly the report does not touch India, but the moral that it enforces is the same for your country as it is for the homeland—to be serviceable in the coming days of stress and competition education must be more practical.

ARNOLD WRIGHT.

Colonel Yate asked the Secretary of State for India, on July 29, whether, in view of the importance of lac to the commercial and military interests of the Empire, and the fact that India held a practical monopoly of this natural resin, large quantities of which used to go to Hamburg and Bremen before the war, information could be given as to what measures would be adopted by the Indian Government to encourage the production of Indian lac and facilitate supplies to British markets?

Mr. Montagu: I can at present make no statement on the subject, but the general question of post-war economic policy is now engaging the close and constant attention of the Government of India.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Motor Operated by River Flow.

Washington, D. C., U.S.A., 16th May, 1918.—The problem of perpetual motion still remains unsolved, despite the centuries of time and vast amount of brain power devoted to its solution. But many mechanical tricks can be performed which, on the surface, look like perpetual motion, and frequently useful application is found for one of these. In this class appears to fall the apparatus built by an inventive American. The contrivance is one to derive power from the current of a river without any artificial head. It looks simple enough. It consists of a wooden frame-work about sixteen feet long by twelve feet wide, which is floated on two buoys and is secured to the bank of the river by cables. Inside the frame-work are slung two sets of sprocket wheels attached to each other by chains. Attached to the chains, at equal intervals, are four big wooden paddles or vanes, seven feet long and two feet wide, each giving a surface of about fifteen square feet. They are so placed that when two of them are above the water the other two are underneath, furnishing resistance surfaces for the river's current. The vanes are geared to two hundred-gallon force pumps, and with a six-mile current, five feet deep, these pumps will force water through a three-inch pipe to a height of one hundred feet and at the same time operate a four-kilowatt dynamo to full capacity. The two pumps generate about fifteen horse-power.

It is easy enough to force a broad resisting surface along with a reasonably strong current of water, the inventor explains. The problem comes when the paddle at the other end of frame-work is descending into the water. The resistance represented at one end will invariably neutralize the movement at the other end,

thus causing a cessation of movement altogether.

Here is where a knowledge of hydrostatics was necessary. The inventor rigged up some auxiliary paddles on each side of the main vans, slung on hinges. Then, by the addition of ratchet arrangements on the big vanes he forced the latter to assume a perpendicular position while under the water, the vanes being automatically released at the instant the sprocket wheel begins to lift them out. Hence the resistance surface of the paddles in the water is always greater than that of the paddle about to enter the water, and the problem of water-current power was solved.

A four-mile current is enough, according to the inventor, to make a force of one hundred gallons a minute pumped one hundred feet above the surface of the river. A contrivance attached to the machine enables the operator to vary the depth at which the current will take effect, thus regulating the speed and consequently the strength of power. The cost of installation, according to the inventor, is about \$40 per horse-power, and the cost of operation is practically nothing, being about three cents per day to oil eight journals.

The value of this invention lies in its ability to pump water with sufficient force to insure irrigation power for any farm or ranch in a dry section, and in the fact it will work continuously so long as there is a river to run it. The total cost of irrigating now runs from \$1.40 to \$25 per acre per year, depending upon locality and conditions. One of these machines will irrigate about forty acres, as in twenty-four hours it pumps 288,000 gallons of water.

ELECTRICAL TREATMENT OF SEEDS

The American press is manifesting considerable interest at present in the question of the application of electricity to agriculture as a means of increasing the supply of home-grown as well as farm-grown foodstuffs. Experiments which have been

going on for several years in the United States have clearly demonstrated that the use of an electric discharge has a very marked effect on crop production.

The subject has lately been brought to the front by one of America's most prominent agriculturists, who, writing in "The American Agriculturist," states that "great and startling improvements in agriculture are on the point of being introduced," and says that a method has been devised to overcome the difficulty and expense of electrification, as applied to both the growing crops and the seed before it is sown. Installations at which farmers can have their seeds treated by experts have been erected at quite a number of centres, and are capable of treating some thirty thousand sacks per month. The increase of yield from seed so treated, though not so great as the increase of yield from electrification of the growing crops, is stated to be considerable, ranging from 25 per cent to as much as 80 per cent.

A FORTUNE IN FLYING CHIPS.

The machining of metal parts of any description cannot be done without a certain loss of metal by the chips falling off during the work. This loss in the case of high-priced metals adds considerably to the price of the article made from the material in question. To reduce this loss a good many methods have been suggested by most of which it is tried to collect the flying chips so that they can be remelted. Even this, however, very often is only possible under great difficulties and it is estimated that millions of dollars yearly are lost to the nation from this source alone. For instance, the aluminum chips coming off while machining aluminum casting for automobile gear boxes total in value more than \$4,000,000 annually. In former times nearly 50 per cent of these aluminum chips were simply thrown away. Now it has become possible to recover a large percentage of the metal by remelting and

the actual loss has been reduced to less than 20 per cent, and there are firms who claim to recover all but about 10 per cent of the metal. By doing so approximately \$3,000,000 have been added to the yearly income of the United States. Here is a chance for machine shop managers to increase the earnings of their plants by making use of what formerly was thrown away.

FLOORS MADE OF WOOD BLOCKS.

Combining all of the essential elements of a good, general purpose, heavy service floor, creosoted wood block floors are becoming quite common in the United States. Although the first cost of this wood block construction is higher than some other types, maintenance cost is almost negligible by comparison because of its great durability, while it makes many economies possible in plant operation.

The resistance of wood block floors to wear is astonishing. Under the extremes of load and heavy traffic the ends of the wood fibre soon iron out smoothly to form a surface that grows stronger and more compact with use; a surface which is claimed to be permanently level and does not abrade, crack, crumble, chip or corrugate. With all this it is the easiest floor to repair, should repairs be necessary. It is firm and hard enough to offer small rolling resistance, yet never becomes slippery or loses its resiliency. It absorbs vibration; is comparatively noiseless and does not originate dust. It is waterproof, decay proof and vermin proof.

Most interesting of all is the fact that wood block floors of the better kind resist high temperature extraordinarily well, and char very slightly even when directly subjected to fire. When set on a concrete base a wood block floor is exceedingly difficult to burn. There have been instances in foundry operation of crucibles over-turned and molten metal poured upon the blocks which showed but little damage. In a fire which completely destroyed a great

railroad pier at Philadelphia, Pa., the structural steel was twisted and warped, and after the wreckage was cleared away the creosoted block floor was found to be damaged very little, suffering only a slight charring on the surface. These blocks were taken up, scraped and relaid, and are still giving excellent satisfaction—a practical demonstration of their freedom from damage by fire.

A shop or factory floor with all these physical advantages must promote higher efficiency both as regards employes and nachabical equipment. Being free from both cold and dampness, noiseless and easily kept clean, working conditions are greatly improved. The absence of dust, and the distinctly antiseptic nature of the creosote preservative, are real factors in securing better health among the workmen.

Owing to the particularly resilient nature of its surface, the wood block floor is comfortable to work on and labour is spared much of the fatigue attributable to floors composed of harder materials. This characteristic also helps to keep tools from being blunted or castings broken that may be allowed to fall. Then, too, the absence of dust saves bearings and other delicate parts of expensive machines from injury. Truck labour is greatly reduced and also the accident hazard is low with a floor that is not broken, uneven or pached and that never becomes slippery.

THE PEANUT IN THE ASCENDANCY.

Those who have the habit of belittling a thing by comparing it to a peanut must seek another simile. To manage a real peanut stand is becoming an undertaking of some considerable moment. The "Weekly Bulletin," the organ of the United States food administration, tells us that peanut hay is very useful in feeding livestock, and that the hulls may be used as fuel (making a hot and lasting fire,) fertilizer and in the tin plate industry. Peanut meats

furnish cake and meal for flour, livestock feeds, fertilizer and dye-stuffs. Peanut oil expressed from the meats is used in cooking oil, salad oil, lard compounds, sardine packing, olive setting, oleomargarin, sweet oil substitute, medical emulsions, cosmetics, soap, kid glove and silk manufacture and miners' lamps.

Peanut oil foots enter into washing powder, glycerine, nitra-glycerine, black grease, soap candle pitch, putty, roofing composition, insulation, linoleums, oilcloths, waterproofing, artificial leather, cheap paint base and fulling ware.

GIVING THE EYES A BATH.

An ingenious American inventor has patented a pair of miniature bath tubs for the eyes. The "tubs" fit the curve of the head, and are equipped with inlet and outlet passages so that with the aid of a small rubber tube it is possible to conduct the water direct from the faucet to the eyes and back to the drain without the inconvenience of putting the head in the water.

After using the eyewash cups for some time with the best of results the inventor put a pair in the hands of the director of a large eye clinic, who found them of excellent service. When foreign substances such as lime, acids or poisonous gases enter the eyes and continuous washing with fresh water is essential, some such device as this affords the best means of meeting the situation.

This eye-washing device is made of good, acid-proof material. The cups are provided with glass fronts, so that the doctor or the patient can observe the action of the washing liquid; and especially advantageous is the fact that application may be made in any position whatever, and with one or both cups at a time. The water can be led direct from the faucet, or, if a special solution is to be used, from an elevated reservoir.

COOLING UTENSILS OF PURE NICKLE.

Recent demonstrations have proven conclusively that pure nickle for cooking

utensils has many striking points in its favour. Pure solid nickel should not be confounded with the much inferior metals frequently sold as nickel, which consist of steel, brass or German silver with a thin plating of nickel. This plating wears off in a short time, leaving the articles unserviceable and worthless.

Pure nickel, on the other hand, does not rust or oxidize, and consequently every danger of poisoning generally caused by verdigris is eliminated. Neither will the metal tarnish and, even though the surface be injured, there is no danger of corrosion resulting as in a plated article. Furthermore, the tedious and expensive plating operation is entirely abolished. This makes the metal particularly adaptable for use in the manufacture of cooking utensils or food handling equipment where the highest precautions must always be observed to avoid infection and poisoning. The advantage of perfect safety lasts as long as the article itself, whereas plated utensils must be discarded or replated upon the appearance of the slightest break in the nickel protecting surface.

While not so good a heat conductor as aluminum, nickel utensils are made of a thinner material, which more than overcomes the difference. Pure nickel has a melting point of about 2,600 deg. Fahr., whereas aluminum has one of about 1,200 degrees. There is not the same possibility of this metal being softened under constant use. The metal is much more resistant to the action of the acids commonly found in food products, and is practically immune to alkaline attack. The fine, silver-like appearance of pure nickel does not change in use, and the cleaning of these utensils is as easy and simple as possible, hot water or soda being quite sufficient.

Nickel has a high tensile strength in the sheet form, being homogeneous throughout, is ductile and easily formed by spinning or stamping. No special equipment is necessary for manufacturing articles from these sheets, the same tools and metals being employed as with German silver or hard alloys.

The great increase in the cost of copper and its products has brought pure nickel to the point where it can be compared favorably as to initial cost, without counting long life and service.

A MECHANICAL RESTAURANT.

In a great electrical plant in New York, where meals are served to 3,500 employes per day, the dinners of five years ago are still possible at the same 25-cent charge, in spite of the persistently higher cost of living. This is made possible by skilful application of engineering principles in the kitchen and in the serving room.

Of the 3,500 meals served daily, 500 are breakfasts, 200 midnight lunches, 300 suppers, and 800 are delivered in the shops. This leaves 1,700 meals to be served during the noon period in the main restaurant building. The situation involved mechanical difficulties which could be met only by mechanical means.

The essential feature of the new service was the installation of a self-serving system, expedited by four conveyor belts. Under the old plan fifty waitresses served approximately 1,000 meals, each waitress delivering food for twenty customers. With the new arrangement 1,700 men serve 1,700 meals—to themselves. The average time required by a customer, from the pay-as-you-enter cash desk till he is served and seated, is less than one minute. The procedure is as follows: Promptly at the blowing of the noon whistle four lines of men form in front of four cash registers to purchase their luncheon tickets. A cashier will make change and sell twenty-nine tickets per minute. As the men file past the cash desk they approach at right angles the end of one of the four belt conveyors. Adjacent to the nearer end of this is a station at which the ticket is exchanged for an aluminum tray. This is deposited by the luncher upon the conveyor, which moves it along the front of the food counter at the rate of sixty-five feet per minute, allowing the customer fifteen seconds in which to select his food. Following his tray as it slides down the line he helps himself, first to meat or fish, then to tomatoes and potatoes, next to pudding or pie, and finally to milk or coffee. All these articles are waiting for him on a hot steam table parallel to and behind the belt. By the time he has got all that is coming to him he and his tray are at the other end of the belt, where the checker O. K.'s the contents of the tray and permits the man to proceed.

ALFRED T. MARKS.

NOTES.

We quote from the *Board of Trade Journal*:—The cultivation of cotton in Spain has formed the subject of a memorandum to the Government from the "Diputacion Provincial de Barcelona," making the following proposals: (1) The Government should set apart large tracts of State land for experimental and educational purposes, and provide the necessary machinery and materials, under the direction of State Engineers. (2) Pending the result of such experiments, there should be conceded temporarily to cotton growers:—(a) Exemption from all taxes on land, buildings, and labour until the cotton is baled; (b) All facilities given to agricultural and industrial syndicates; (c) Reduced rates for railway transport. (3) State purchase of suitable seed and resale to growers at half cost. Provision of various classes of seed for experimental purposes. (4) State guarantee to refund any difference if buyers are obliged to sell at less than 1'25 pesetas per kilog. (5) Government to provide necessary separating plant. (6) Formation of a commission for the protection and cultivation of cotton in Spain, governed by experts, whose mission will be to report progress to the Government.

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The Government of India announces that recent investigations do not confirm the supposition that the local resources of India, in existing war conditions, can economically be turned to account for the construction of cargo steamers for Government use. The Government is, however, prepared to encourage the construction by private enterprise of such wooden sailing ships, with or without auxiliary power, as can be readily built in India. The proposals for building ferro-concrete ships in India are to be held in abeyance for a few months pending the results of experiments elsewhere.

The following Press Note has been issued by the Director of Industries, United Provinces:—The fifteenth meeting of the Board of Industries was held at Cawnpore on the 25th April, 1918. Government has approved certain rules previously recommended by Board of Industries for the training of apprentices in glass blowing at the United Provinces, Glass Works, Bijhoi, Dt. Moradabad. The Board noted with appreciation that Government has been pleased to sanction a grant of Rs. 10,000 for experiments in tannin and other dye extracts, and a loan of Rs. 30,000 to Mr. A. H. Mirza, Proprietor of the Ramnagar Cutch Factory. It was noted that Government has sanctioned the appointment of an Advisory Committee in connection with the Leather Working School, Cawnpore. The Board was pleased to note that the Government of India have authorized the Local Government for the provision of 1st class tickets to all State Scholars during the period of war, for the journey from Marseilles to London as long as the conditions of travelling in France render it necessary. It was also noted that facilities are procurable in the United Kingdom for the study of wood distillation.

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The Food Production Department of the Board of Agriculture and Fisheries have discovered the value of the silo as a storer of winter food for cattle and sheep. A very useful illustrated pamphlet has been published on the subject, a number of details as to construction and management of the receptacles being given. The Department say they are "satisfied that it is commercially to the interest of farmers and nationally important that the use of silage on up-to-date lines should be greatly extended." Consequently the Department is prepared to help agriculturists who wish to build silos on their farms in the following ways:—
(a) By giving expert advice in all cases

where the construction of a silo is contemplated; (b) by supplying free of charge full working drawings, specifications, and bills of quantities for two sizes of silos constructed in either reinforced concrete or reinforced brickwork, in cases where the landowner or farmer wishes to make his own arrangements for building the silo; (c) by lending at a moderate charge all forms and centering needed for the construction of one of the standard silos, and facilitating the issue of permits for materials; (d) by contracting with the landowner or farmer for the complete construction of silos at a fixed price; and (e) by assisting any one who wishes to construct a concrete or brick silo of some approved type, but of a size or design other than one of the standard types mentioned above, to obtain priority certificates for the materials needed. The conditions on which the Department is prepared to help are set forth briefly in the pamphlet, which also contains details as to approximate cost, the ensilage of chaffed or unchaffed crops, the best sites for silos, suitable crops, and the approximate acreage required of maize, oats, and vetches, lucerne, red clover and ryegrass, red clover, meadow grass, or sainfoin.

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- According to the Annual Report of the Basle Chamber of Commerce, the Swiss Dye Industry views with great concern the rise of a dye manufacturing industry in other countries, particularly in England and America. It was thought at first that the development of such an industry would be seriously handicapped by the lack of the cumulative experience and inherited skill of many years, but owing to the fact that Swiss chemists have in many cases offered their services, this industry has already made great strides in the countries named. The report states that in America especially dye factories have sprung up like mushrooms, and there is already danger of over production and consequent disaster. Reference

is made to British Dyes, Ltd., in England and also the French Company. The prospect of establishing a Dye industry in Italy is not considered bright. In regard to acids, the report goes on to say that the greater part of the production of Hydrochloric Acid, Sulphuric and Nitric Acids is required for the manufacture of munitions in Switzerland, so that there is scarcity of acids for other purposes. A new Sulphuric Acid factory is, however, being erected in Schweizerhalle. Also the new Swiss Soda Factory at Zurzach was able to commence manufacture in August 1916, although the output is at present very small. The supply of raw materials from England and America is gradually becoming less, and the difficulties of the Swiss Chemical Industry are correspondingly greater. But the greatest difficulty of all is the prospect of a coal-famine, especially in view of the fact that the supplies of substitutes such as wood and peat are not very plentiful. The manufacture of artificial indigo is now very seriously handicapped in Switzerland owing to the lack of raw material.

GLEANINGS.

Mr. Montagu, replying to a question by Colonel Yate, who asked what steps had been taken by the Government to put a stop to the mixing, adulterating, and watering of Indian-grown cotton, said :—The Government of India are now considering, in consultation with the Chambers of Commerce in India, the measures to be adopted to prevent the adulteration of Indian products, including cotton. Similar inquiries are being undertaken by the Indian Trade Commission in London. Special legislation has not been introduced, and hitherto the view held by the Government of India is that it would be extremely difficult to carry such legislation into effect, that trade would be seriously hampered, and that as a practical remedy such measures would prove ineffectual. While keeping an open mind on the subject, the Government of India consider that the proper agency for dealing with these abuses is the trade itself, either by an arrangement between exporters and buyers that the latter should insist on freedom from adulteration, or by the establishment, under the control of Chambers of Commerce, of some system under which the purity of products would be certified before export.

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Motor car manufacturers would be well advised to spare no efforts to cultivate the Indian market after the war, for recent returns show that the use of the motor car in India has made rapid strides during the last few years. Thus, in 1916-17, 4,778 motor cars were imported, against 3,121 in 1915-16, 2,005 in 1914-15, and 2,800 cars in 1913-14. Almost the whole imports in 1916-17 came from the United States, the figures being 4,169, while the United Kingdom supplied 489. How this compares with pre-war imports can be seen from the figures for 1913-14, when the United Kingdom supplied 1,669 motor cars, against 868

from the United States. In this respect the war has given America a great advantage, and it will take our manufacturers all their time to recover the position lost through war restrictions. In India, as elsewhere in the East, it need hardly be emphasised that attention to local requirements is one of the most important essentials for trade development, and if the competition which has grown up during the war in regard to motor cars and other commodities is to be successfully combated it will only be by the most careful treatment of the market.

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The great advantages which the farmer obtains from the utilisation of electricity, when it is cheaply obtained, have often been pointed out in these columns where electricity can be generated at a very low cost by the utilisation of the water-power from water-falls and rivers. In Switzerland the farmers and peasants use electricity for many farming and domestic purposes at very cheap rates, whilst in America the price of electric power is within the reach of the purse of the poorest farmer, and, according to recent rates, a farmer can buy enough electricity with one penny to milk ten cows, churn 20 lbs. of butter, separate 1,400 lbs. of milk in a cream separator, do two large family washings, heat an electric flat iron for half-an-hour, run a sewing machine for four hours, pump water enough to last the family two days, and serve many other useful purposes. This is calculated at the rate of 10 cents per kilowatt-hour the price usually charged in the United States, and a price which can be secured in Serbia, Macedonia, Greece, Egypt, Syria, Mesopotamia and elsewhere if the water force of rivers and water-falls be utilised.

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By a new process recently invented, aluminium can be fixed securely to cast-iron, yielding a surface equal to rolled aluminium. The iron article is first galvanised or tinned, and then dipped in molten aluminium at

700°—800° C. Whilst so immersed the surface of the work is swept by steel brushes, with the result that the tin or zinc passes into the molten aluminium and is replaced by aluminium on the surface of the iron. Two or more aluminium dipping baths may be employed, but most of the tin or zinc remains in the first bath. Excellent adhesion and freedom from corrosion are claimed, and the total cost of the coated work shows a saving as compared with solid aluminium.

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Australian ingenuity is responsible for the invention of a device which will be welcomed by every farmer, especially those in the East, where unreasonable winds and rains frequently lay the crops flat and harvesting becomes tedious and disappointing. This device is for picking up crops laid flat by wind and rain, and is in the shape of a false comb for attachment to any stripper, harvester or reaper thrasher. It is claimed that the merit of the design lies in a wonderful flexibility and free movement of the prongs forming the comb, and the fact that any prong broken or bent can be replaced by a "spare" in less than a minute.

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The Cairo correspondent of *The Times* announces the foundation of a Hebrew university at Mount Scopus, near Jerusalem. General Allenby attended the ceremony, as did French and Italian officers and a deputation of Egyptian Jews. Twelve stones, symbolical of the Twelve Tribes of Israel, were laid, the first by Dr. Weizmann, the others by representatives of the various branches of Jewish life in Palestine and the Diaspora. Chairs will be created for all arts and sciences, and will include one for Arabic.

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Mr. Montagu said: The Government of India propose to constitute a small commit-

tee of electrical, mechanical, and irrigation experts to visit the different provinces, and, after conference with the local officers, to examine promising sites and to report whether a detailed survey is worth undertaking. The local Governments are being asked to collect information, both physical and commercial, in advance, in order to facilitate the committee's investigations.

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At a meeting of the Preston Chamber of Commerce on June 25, Mr. A. O. Goodier, the secretary, referred to the suggestion that an extended use should be made of Indian cotton, and stated that the idea was regarded with disfavour by employers and co-operatives alike, as it would involve the introduction of new plant and the adoption of new processes in the spinning and weaving sections.

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The inadequate provision of the forests of the United Kingdom for national needs is shown by the fact that only Portugal of all European Countries ranks lower than Britain in percentage of total area under forest. Great Britain has just 4 per cent in woods, Sweden 47 per cent, Russia in Europe 37, Germany 25, Norway 21, France 18.

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The production of wood meal as a food stuff will soon be realised. A factory for this purpose is connected with the eastern army head-quarters at Souvalki; there are two factories using Steffen's method, and another being built. The War Committee for cattle food substitutes controls the use of this meal.—German official Report.

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The *Rheinisch-Westfaelische Zeitung* states a corn monopoly will be immediately established in the Ukraine, in accordance with the decision of the Cabinet, which orders all producers to deliver their produce direct to the State depôts.

TOPICS FROM ECONOMIC PERIODICALS.

RECOMMENDATIONS AS TO ORGANIZATIONS.

The following are further recommendations of the Committee appointed in July 1916, under the Presidency of Lord Balfour of Burleigh to consider the commercial and industrial policy after the war :—

We recommend in this connection :—

(a) That it should be a legislative requirement that all international combinations or agreements (or combinations or agreements which are made directly or indirectly on behalf of foreign interests) to which British companies or firms are parties, made for the regulation of the prices of goods or services, or for the delimitation of markets, should be registered at the Board of Trade by the British persons, firms or companies concerned, with a statement of the names of all the parties thereto and of the general nature and object of the combination or agreement; and that all modifications of such agreements and all adhesions and withdrawals should also be notified.

(b) That it should be optional for the parties to any combination or agreement between British firms having for its object joint marketing arrangements, either in the United Kingdom or abroad, or the regulation of prices or output, or the delimitation of markets, to register such combination or agreement at the Board of Trade, with a statement of the names of the parties thereto, and as to its general nature and object; and that such steps as may be necessary should be taken to make any price or other market agreements made by or resulting from combinations and agreements so registered enforceable at law as between the parties thereto.

(c) That in order that the Board of Trade may be able to keep itself fully informed as to the nature, extent and operations of industrial combinations in the United Kingdom or of international combinations of which British firms, companies or associations form part, that Department should have power to call upon individual consolidations or combines from time to time to furnish for its confidential use such information as it may require.

FINANCE AND INDUSTRY.

As regards the question of Financial Facilities for Trade we refer to the recommendations of the Special Trade Committees and to the Report of the Committee appointed by the Board of Trade which led to the establishment of the British Trade Corporation, and we summarize the evidence which we have received

as to the general objects of the Corporation and the work which it will undertake.

We deal with a scheme which has been placed before us for the establishment of an Imperial Bank of industry under a guarantee of the United Kingdom and certain Dominions and Colonies. We are unable to recommend the adoption of this scheme. In our opinion the financial needs of British industry are likely in normal circumstances to receive better examination and to be met in a more elastic and effective manner under private banking enterprise than be means of a State-controlled institution.

We recognize that the satisfaction of the urgent demand which will arise after the war for capital for the re-establishment of industry on a peace basis will be profoundly affected by the policy of the Government in regard to taxation, the currency and the maintenance of the foreign exchanges, and we recommend that these matters should be the subject of early enquiry by the Treasury in consultation with representatives of banking and commerce. As a general rule we think it undesirable that the State should itself attempt to provide capital for industrial purposes.

We think that the existing control of capital issues should be relaxed as rapidly as circumstances permit, subject to further consideration as regards loans to foreign Governments or States.

In our opinion the remedy for the shortage of capital after the war must be sought mainly in the increase of production and saving. The attainment of these objects can be appreciably affected by the avoidance of unnecessary and wasteful expenditure by the State itself and by the extension of the taxation of luxuries.

The most important permanent instrument of taxation both from the point of view of revenue and as regards its effect upon production and the scale of personal expenditure will, however, continue to be the Income Tax. We draw attention to the observations of the Special Committees upon the inadequacy of the allowances now allowed for depreciation and wear and tear of machinery and plant. We are of opinion that depreciation should be allowed for Income Tax purposes on an adequate scale according to the circumstances of each case, and we recommend that immediate steps should be taken for this purpose by the Treasury. Having regard to the far-reaching effects of the tax at its present high level upon industrial reconstruction, we strongly urge that the principles upon which it is based should be fully reviewed at the earliest possible date, with a view to enabling the State to raise a revenue at least as large as at present with less damage to productive industry. The enquiry should include consideration of the Death Duties.

WATER-POWER IN INDIA.

Speaking before the Royal Society of Arts on April 18, on "Water-Power in India," Mr. Alfred Dickinson, M. Inst.C.E., M.I.E.E., M.I.Mech.E., said that the most important scheme thus far was that of the Tata Hydro-Electric Power Supply Company. It was frequently said that engineers lacked imagination, and that there was no such thing as romance in engineering. He believed that the Tata Hydro-Electric scheme disproved those statements. The general impression was that water-power was the utilisation of the water of existing rivers or lakes. The Tata Hydro-Electric undertaking was not of that character; it was a scheme to provide, approximately, 100,000 water horse-power from valleys which had from time immemorial been dry for nine months of the year, and where no water had been previously stored. The valleys were so dry that one of the initial difficulties in covering them into lakes was to provide water for use in building the masonry dams.

When the scheme was in process of development he was advised by engineering friends not to risk his reputation by being associated with "such a perfectly absurd engineering proposition," and on generally accepted engineering principles he admitted that if the scheme had been placed before him for advice he would have reported against it. Many looked upon the question, not as a serious engineering proposition but as a fairy tale. But even in engineering the exception proved the rule. The Tata Hydro-Electric scheme could only be justified on that ground. This would be appreciated when it was stated that, even after the work of building the dams had been in hand for some very considerable time, the company were advised that the supply of water would be insufficient because the catchment area could not yield water to fill the lakes. Those versed in these matters would agree that the engineer did not lack confidence who advised that rain falling during the monsoon and total catchment area of twenty-two square miles would be sufficient to enable, roughly, 100,000 water horse-power to be developed for 3,600 hours in each year, but it was confidence begot by experience and knowledge, and now justified by results. The catchment

area was exceptional to the extent that almost all the water falling ran off.

His view was that the Indian Government should at once undertake a complete investigation of the possible sources of water-power in the Indian Empire, and the information obtained should be available for public use. Perhaps this would follow as a corollary of the investigations of the Industrial Commission now sitting in India.

Private enterprise had already done much, and was doing more. Messrs. Tata, Sons and Co., Bombay, had been the pioneers, and continued to lead the van. As a result of investigations made at their expense, it could now be demonstrated that, by constructing a dam across a valley in the Western Ghats, water from the Koyna River could be harnessed so as to provide approximately, 300,000 h.p. continuously. The preliminary estimates of cost showed this scheme to be a thoroughly sound commercial proposition.

In his opinion this was a discovery of the highest importance to the whole of the East. If a Niagara had been announced the world would have been agog, perhaps more from a spectacular than a power-producing point of view. When the possibility of supplying 300,000 h.p. for every hour in the year is appreciated it would be seen that it was equivalent to supplying to industries during the normal working hours of 3,600 per annum no less than 730,000 h.p. for each and every working hour of the year.

ITS INDUSTRIAL VALUE.

He was investigating the possibility of utilising for power purposes the irrigation lake at Periyar, in the Madras Presidency. So far the investigations showed that a thoroughly workable and commercial scheme for the manufacture of nitrates on a large scale could be established. He was aware that power could be obtained from the Bari Doab Canal and the Dudh Sagar Falls, and he had every reason for believing very considerable power could be secured in many parts of India. The advantage of water-power development in India would be apparent to those interested in, and who appreciated the industrial awakening of this vast Empire, for water-power development could and would materially hasten that awakening. The rapidity of industrial and agricultural development would, in his view, be largely dependent upon a closer union between the East and West.

Although much had been done, to use a vulgarism, India's industrial possibilities had scarcely been scratched. It was well-known that not infrequently the obvious was overlooked. His view was that so far as the captains of finance and industry of the West were concerned, they had not been altogether

ignorant of the possibilities of industrial development in India, but hitherto they had not shown the necessary confidence by taking part in their helping forward rapid development. They had an opportunity to finance and construct the Tata Hydro-Electric scheme, but failed to appreciate its importance, and it was left to India to find the requisite capital, to the great advantage of the Indian investor, for it was the only electrical undertaking of magnitude which, in the first year of its working, had earned and paid a dividend on its full capital; and, although it was as yet incomplete, it was earning a profit of over £190,000 per annum.

FRUIT BOTTLING.

The following notes are taken from a leaflet on "Fruit Bottling for Cottagers," issued by the Royal Horticultural Society:—

It is important to secure a good supply of suitable bottles before the fruit season comes. The right bottles should have, first, an India-rubber band which lies flat on the rim of the bottle; secondly, a flat glass lid which lies on the rubber ring; and thirdly, a metal screw which fits over the neck of the bottle and over the glass lid and screws down tight on to the glass lid, settling it down firmly on the rubber ring and so making the bottle air-tight.

The bottles once purchased will (if taken care of) serve well for very many years to come, although the rubber ring may want renewing every fourth or fifth year.

The bottles should be thoroughly cleaned and dried. Glass vessels of any sort should not be put when cold into hot water, or when they are hot should not be put into cold water or even placed on a cold surface such as a stone slab, or on bricks. The very smallest crack in the bottle may make the whole contents go rotten.

The fruit should be picked when it is just ripe and no more. It should be cleaned and dried, and packed closely in the bottles, which should be quite full. Apples and pears should be cut in quarter; all other fruits should be put in whole. The bottles should then be filled with clean warm water, the rubber ring and the glass lid should then be put on, and next the metal rim placed loosely over them. It should not be screwed down tight at present. The bottles should be placed up to their necks in cold water in a fish kettle or open boiler, which should have a false bottom so as to prevent the bottles standing on the thin metal bottom of the kettle, which gets so hot as occasionally to crack the glass. A little hay should be put round the bottom of the bottles to prevent

their hitting one another when the water boils, and so getting cracked. The water in the kettle should be brought very slowly to the boil, and then allowed to boil for 15 or 20 minutes. Then each bottle should be taken out separately, and without a moment's delay the metal rim should be screwed down tight upon the glass lid and rubber ring below it, whilst the water in the bottle is at boiling heat. The neglect to screw the lid down tight immediately the bottle is taken out of the kettle is at the bottom of almost all failures.

Gooseberries, raspberries, currants, plums, damsons, blackberries, apples, pears, and most other fruits may be preserved in this way. Strawberries are not recommended.

The contents of the bottle can be used in any way in which fresh fruit is used, by cooking it in pudding or pies, or by stewing it with a little sugar.

CANADIAN INDUSTRIAL PROGRESS.

The Industrial Canada, (Page 1136, for December, 1917,) says:—

Results announced of the 1916 Postal Census of Canadian Manufacturers for the Calendar year 1915.

The Postal Census of the Manufacturers of Canada taken in 1916, for the Calendar year 1915, just issued, shows a general expansion in the manufacturing business of the Dominion. The number of establishments in operation was 21,306, representing an invested capital of \$1,994,103,272, employing 52,683 persons on salaries and 462,200 persons on wages, and producing goods to the value of \$1,407,137,140 from raw materials valued at \$802,135,862.

During the decade 1905-15, the number of establishments increased approximately 34 per cent; capital 135 per cent; employees on salaries 44 per cent; employees on wages 29 per cent; salaries 96 per cent; wages 70 per cent; and the value of products 95 per cent.

The value of the products of factories in 1915 was \$1,407,137,140, as compared with \$718,352,803 in 1905, an increase of \$688,537, while wages paid totalled \$229,456,210, an increase of \$95,080,285.

There were in Canada during the year covered by the statistics sixty-five establishments employing over 500 hands; twenty-five employing over 1,000; nine employing over 2,000; five employing over 3,000; and three employing over 4,000. Of these three establishments two employed over 5,000 hands.

During the five-year period, 1910-15, the capitalisation of Canadian Industrial enterprises increased by \$ 746,520,663, or about 60 per cent.

To recapitulate briefly, if we are to pay for this war by acceleration of our Industrial activities any scheme for the broadest distribution of cheap power is of the utmost importance. Water-power provides great possibilities in coal-less territory and where coal cannot be cheaply imported.

Cheap power means the more universal application of it, with a consequent release of man-power which for many years will be scarce and expensive. Canada at the present time uses about one and a half times the amount of mechanical energy per worker that we do. Schemes for national reconstruction and social betterment are meantime rife, and much is expected of a sound practicable land policy.

I have elsewhere contended that any successful policy for an agricultural renaissance must be associated with an industrial policy, and utilisation of water-power and afforestation are pre-eminently attractive from this point of view.

The rural homes throughout the country are occupied by old people, maintained by their sons and daughters employed in the great cities, and unless the younger generation find remunerative and attractive employment where they are born they will not settle down there. Moreover, the poverty of our rural districts has been for long attracting attention, and unless something be done which will increase the rateable value there, it looks as if taxation for public services, such as Education, Poor roads, Sanitation, etc., will eventually have to be met by the State.

Already in some districts in the north of Scotland taxation is in excess of the gross rateable value, and such a condition of things is economically destructive in any State.

It is much to be desired that such work as that done by the British Rainfall Organization and the Scottish Meteorological Society should receive more support and recognition than it does.

Notwithstanding present-day developments in scientific research, there are still those who believe that the recording of rainfall temperature, hours of sun shine, and direction of wind currents is little more than a "harmless craze".

It is quite possible, however, that the development of aerial flight, which will be of immense interest in the future, will direct attention to this branch of science, and that the work of the past and present meteorologists will yet be appreciated as it deserves to be.

ECONOMIC NOTES. INDUSTRIES AND COMMERCE.

Spanish Forests and Paper Manufacture.

The Spanish market uses annually 28,000 tons of paper, of which newspapers account for one-half. Spain produces 15,000 tons of mechanical pulp per annum, from which an approximately equal weight of paper is manufactured. Consequently she is obliged to import 3,000 to 4,000 tons of mechanical pulp and 10,000 tons of chemical pulp.

Trackless Forests.—It is asserted that there is sufficient wood in Spain to cover the amount of the imports, and that it is the lack of roads which hinders the working of the woods under economic conditions. In Spain the raw material for paper-making is not very costly, but no one cares about it, and the forests remain practically unused. As an instance may be cited the magnificent firewoods of the Aran Valley, consisting of *Abies pectinata*, the species best adapted to paper-making. A beginning was made in the management of 37,500 acres, and the yield from these forests reached nearly 16,000 cubic yards. Unfortunately the work was stopped on account of administrative difficulties connected with boundaries and other questions of secondary importance.

Workable Woods.—In the Pyrenees of Aragon and Catalonia, chiefly in the provinces of Huesca and Lerida, there are 122,500 acres of fir wood, capable of providing 39,000 cubic yards of wood per annum. As the wood has a high moisture content this quantity would make about 15,000 tons of mechanical pulp, or 10,000 of chemical pulp, which is nearly enough to tide over the crisis that the war has caused in the paper trade. It does not seem possible to work these 122,500 acres in an intensive manner all at once, and it is suggested that the working of the Aran Valley, mentioned above, should be continued; the 39,000 cubic yards of wood obtained would be equivalent to 6,000 tons of mechanical pulp, or 4,000 tons of chemical pulp.

The remainder could be provided by the pine forests (*Pinus sylvestris*) of Soria, Burgos, Sierra Carpetana, and Cuenca. The Spanish pine wood contains more resin than that from the Baltic and Sweden, and consequently is less suitable for paper manufacture. Nevertheless, this species occurs at various altitudes, and it is probable that *Pinus sylvestris* from the dense woods of the higher parts of the country closely resembles that from Northern Europe.

The conclusion is drawn that the problem of providing raw material for paper-making could be solved if the Forest Administration were to take the matter up seriously.

Transport.—This is a more difficult problem to solve than the preceding one. In practice the freight from Sweden to Spain, to Pasajes (Guipuzcoa Province), is lower than the cost of transport from Sierra Guadarama (Province of Madrid and Segovia) to Guipuzcoa or Biscay, where important Spanish paper factories are situated. The Government may prevail upon the railway companies to concede a lower tariff, but it cannot improvise means of road transport.

The Spanish paper industry has a producing capacity great enough to meet the needs of the country; the Spanish Paper-making Company is responsible for 68 per cent of the total output. Apparently means are available to produce the whole of the mechanical pulp necessary, but not the chemical pulp, because the manufacturers are not provided with the needful plant. The paper factory at Villalba (Navarra) is an exception to this, as it produces a small quantity of semi-chemical pulp.

Replanting with poplars, especially Canada poplar, is suggested as a means of providing the most rapid solution of the problem, while at the same time it would give a return of 12 to 14 per cent on the capital outlay.

UTILISATION OF SAWDUST FOR COOKING.

A simple and ingenious contrivance for cooking, utilising sawdust for fuel, has lately been introduced at Nice with good results. The little stove used consists of a cylindrical box made of sheet iron, about 7 $\frac{3}{4}$ in. in diameter, and 8 in. deep, without lid. This is filled with sawdust to within about 1 in. from the top, leaving the rim, which is pierced with eight holes $\frac{3}{4}$ in. in diameter, uncovered. Three small pieces of sheet iron, bent at right angles, riveted inside, below the top, serve as brackets to support the saucepan or other cooking vessel at the right height above the charge of sawdust. It is also provided with two light handles for convenience in moving. Before filling the charge of fuel, a piece of wood 10 $\frac{1}{2}$ in. long, tapering from 1 $\frac{3}{4}$ in. diameter at one end to 1 $\frac{1}{4}$ in. at the other, is placed, small end downward, in a vertical position on the bottom of the box. Another piece of wood, 1 $\frac{1}{2}$ in. diameter and 6 in. in length, is inserted through a hole in the side, at the level of the bottom. One end of this

piece is slightly hollowed so as to fit the lower end of the vertical one. These two pieces of wood form a kind of core or mould, round which the sawdust is firmly packed with a wooden rammer. When filled, the wooden moulds are carefully withdrawn, leaving a vertical and a horizontal hole.

For lighting, a few drops of petroleum should be poured down the vertical passage, and a lighted taper is then inserted through the horizontal one. After a few minutes, when the sawdust is well alight, the cooking vessel may be placed on the stove.

A charge of fuel, which will last from three to six hours, will be sufficient to cook the dinner of a small family, as well as heating a kettle of water to wash up afterwards. The stove will be also found very useful for heating a flat-iron and other domestic purposes.

SWISS MUSICAL-INSTRUMENT INDUSTRY.

According to a report by the United States Vice-Consul at St. Gall, organ-building in Switzerland has been brought to a high degree of perfection, and Swiss organ-builders have become world-renowned. Since 1864 the two oldest Swiss firms engaged in making these instruments have finished almost 1,000 organs with single, hydraulic, and bellows working.

The Swiss manufacture of pianos may be traced as far back as the first half of the nineteenth century. In 1842 and 1847 the first Swiss piano factories were established, followed by others in the years between 1870 and 1880. A certain decentralisation in this line of manufacture made itself felt in a most advantageous manner, which greatly and beneficially influenced the quality of the instruments, for the various mechanical parts and keyboards are now made by special manufacturers by means of precision machines, whereas the piano factories devote their experience and labour to a harmonious construction. They are provided with modern and effective drying chambers for the necessary treatment of the wood, so that it remains unchanged by the influence of the weather or the tropics—a fact of special importance for the export trade. More than 80,000 instruments have left Swiss factories, and now the monthly production in eight factories is as many as two hundred instruments of high quality.

Of more recent date is the manufacture of poano-forte players, which also has met with success. The two systems, Phonola and Dea, have a good reputation. Concertinas are produced chiefly in the district of Langnau. They are very carefully made in small

quantities, and are said to be superior to others on account of the clearness and softness of the tone. The manufacture of wind instruments is carried on particularly in the Canton of Berne, where it became established about the middle of the last century. Originally it was the turners who took up the manufacture of wooden wind instruments. Gradually they began to occupy themselves by making valveless brass instruments, key bugles, and, finally, valve instruments. Switzerland now possesses a well-known permanent industry of wind instruments which has its principal seats in the Cantons of Berne, Aargau, and Basle.

The manufactures of string instruments—the oldest firm in this line started at the beginning of the last century—have refrained from manufacturing instruments on a large scale, and have paid great attention to quality.

The construction of orchestrions, phonographs and gramophones should be mentioned. These are made principally at St. Croix, a town which works especially for the export trade.

THE FUTURE OF DRIED MILK.

In the valuable series of food reports issued by the Local Government Board no more important or opportune one has appeared than that recently published, which in the main deals with the case for dried milk, says *The Lancet*. This report, indeed, goes so far as to suggest that, provided the methods of manufacture and conservation of dried milk are carefully conducted, a revolution may be at hand in regard to the present system of distributing milk. The public has been accustomed to look upon milk as a fluid, but modern methods of reducing this fluid to a powder, from which, by the addition of water milk can be "reconstituted," point to great economical advantages in dealing with a precious food commodity, for dried milk can be placed at the public disposal without the decided drawbacks of perishability. Perishability is the most serious consideration in regard to so many of our food supplies, and perishability is often but a matter of water content. Where the stability of a food can be ensured by simply withdrawing moisture an economic gain to our food-supplies will have been attained. There can be no better example of food wastage than that which occurs in the case of milk simply because it is a fluid. Dr. F. J. H. Coutts, who is mainly responsible for the report under notice, says in his exhaustive inquiry:—

"Liquid milk is clumsy to handle in bulk and inconvenient for transport. With dried milk practically only the solids of milk are retained, hence the

labour and cost of transporting the water, which represents about seven-eighths of the total weight of fresh milk, are avoided. Further, dried milk can be put up in packages which are convenient to handle and store. Delay in railway transport, which is disastrous in the case of such a perishable commodity as liquid milk, is not a serious matter in the case of dried milk."

These conclusions are, we think, incontestable, but the question remains whether it is possible to offer the general public a dried milk which for practical purposes is reconstituted by the addition of water into a fluid identical with the original secretion of the cow. It is fairly obvious that such a consummation would mean that the spoonful or two of milk powder stored cleanly and safely in the larder would be all that would be required to keep the domestic milk-supply going for a day. We may with advantage note some of the considerations bearing upon this point which are germane to the Local Government Board Report. Milk is, of course, a fatty food, one-fourth at least of its solids consisting of fat. Accordingly, when dried, a powder is obtained containing as much fat as, say, from 25 to 28 per cent. The other constituents—casein, milk sugar, albumin—when kept dry offer no difficulty, but the fat is liable to alter just as butter is, for it is susceptible to bacteriological and to chemical attacks. The latter are in general due to oxidation, of which the slightest degree is rancidity, when the milk becomes offensive in flavour and smell without gross chemical change. This change, however, would not appear to affect the nutritive value of the milk, but the resulting loss of palatability is nevertheless an important matter. As well-known researches have shown, the attractiveness of food is a very important factor, and it is therefore of the utmost importance that any artificial steps taken to preserve food should leave intact its natural characters, and should not alter for the worse any of its attractive features. Dr. Coutts reviews the various processes for reducing fluid milk to the state of dry powder. These processes practically resolve themselves into (1) concentrating the milk in vacuum pans and rapidly drying the condensed milk on hot rollers; (2) spraying the concentrated milk in a current of hot, dry air. The product of process No. 2 "reconstitutes" on the addition of water better than that of No. 1, chiefly because by this process (No. 1) the fat is largely set free and the casein rendered insoluble. By the spraying process the enzymes are preserved, the casein remains soluble, and the fat still exists as cream and not butter fat, and the product emulsifies readily with water, the resulting fluid, except for a slight "boiled" flavour,

being barely distinguishable from normal milk. The keeping powers of both products are limited to some months even when packed in hermetically sealed tins, but it seems that in this respect the powder made by the hot-roller process stands better. In infant feeding there appears to be no dietetic difference of importance between the two products. According to Mr. George Winfield, M.A., of Cambridge, who contributes a report on behalf of the Medical Research Committee on the nutritive value of dried milk, the evidence from weight charts indicates that cow's milk during either process of desiccation loses none of the characters which are necessary for the support of normal growth in infants. The experience of a number of infant-welfare centres is quoted bearing out the value of dried milk in infant feeding, for in the opinion of many authorities one virtue of dried milk lies in the fineness and softness of the curd formed by it, which is so much more digestible than the curd of fresh milk that some infants who cannot digest the fresh or even peptonised milk will thrive on dried milk.

RESOURCES OF BURMA.

Sir Harvey Adamson, K.C.S.I., lately Lieutenant-Governor of Burma, contributes an article of forty pages on "The Material Resources of Burma" to the current Bulletin of the Imperial Institute. With a fertile soil, a rainfall that has never been known to fail, abundant fisheries, magnificent forests, and rich but hitherto almost unexplored mineral wealth, Burma might be expected to offer a promising field for commercial enterprise. Yet, with the exception of rice, teak, and mineral oil, its products have not to a great extent attracted British capital. The chief reasons for this failure are dearth of labour and deficiency in means of transport. With an area three times as large as Bengal, Burma has only about a fourth of the population of that province. Consequently the wages of labour are twice as high as in India itself. The population of Burma is rapidly expanding both by natural increase and immigration. It would expand still faster says Sir Harvey Adamson, if the second great deterrent to the influx of capital were removed, and Burma were equipped with adequate railways and roads. To serve an area nearly twice the size of the United Kingdom, Burma has only 1,598 miles of railway. The length of metalled roads in the whole province is put down on paper as 2,100 miles. But most of these roads are not worthy of the name. Outside towns and

their environs there are few roads that are fit for other than bullock-cart traffic, and very few miles where motor traffic is possible. The provincial contract given to Burma in 1907 was quite inadequate for the equipment of the province with necessary public works, and though the contract has since been augmented by the sum of 15 lakhs of rupees (£100,000) a year, Sir Harvey Adamson considered it still insufficient to meet the requirements of the province within a reasonable time. He gives particulars of the crops, agricultural stock, fisheries, forest products, and minerals, all leading to the conclusion that Burma is a land of rich resources and great potentialities. There can be no doubt that capital judiciously expended, whether by Government in improving communications and developing natural resources, or by private enterprise in exploitation, would be profitably employed. A handsome return has been obtained from the capital already expended on revenue-producing public works. Sir Harvey Adamson asserts that there is no truth in the opinion often expressed that Government is adverse to private enterprise. In the interest of the tax-payer Government is bound to reserve for itself a fair share of the profits earned from the exploitation of the products of the country. Within this limit it welcomes and is ready to give priority to private enterprise. Unfortunately applicants for concessions have too often been adventurers who desire to take much and give nothing in return, and who possess neither expert knowledge nor sufficient capital to utilise the products which they wish to exploit. Such applications, Sir Harvey Adamson points out must be rejected, but where *bona fide* applications for concessions are made by experts or capitalists, the Government of Burma is always ready to welcome them, and never turns them down without reasonable cause. Among other articles in the new Bulletin is one on natural dyestuffs. The scarcity of synthetic dyes since the interruption of commercial relations with Germany has led to a search for new natural dyestuffs and for new sources of supply of the better-known materials. Many samples of such products have been received at the Imperial Institute, and the results of their examination are given in the Bulletin. The chief developments during the war have been, however, in the increased production of natural indigo in India and Java, and fustic in the West Indies. These two dyes are much in demand for the blue and khaki cloths required for naval and military uniforms. With regard to the future of natural indigo it is pointed out in the Bulletin that the present demand will no doubt continue during the war, but the manufacture of synthetic indigo has been started in the United Kingdom, the United States, France, Switzerland and other countries, and after the war the natural product may have to contend with even severer competition than in the past.

PROGRESS ABROAD.

Commercial and Industrial Development in Japan.

THE following report on commercial and industrial developments in Japan by His Majesty's Commercial Attaché at Yokohama is reproduced from the *Board of Trade Journal* :—

REPORTED DISCOVERY OF COAL.

An extensive deposit of anthracite is reported to have been discovered by a geologist and Government expert in the vicinity of the Maizuru Admiralty Port, near Tsuruga. The deposit, it is stated, extends over an area of 25,000,000 tsubo; there are eight strata, each of which is 10 to 20 feet deep and contains five rows of veins.

PAINT INDUSTRY.

Prior to the war Japan had become self-supplying as regards paints, except in the case of special lines, for example, ship's bottom paint, varnish, etc. A small export business had even been initiated, and orders for paints had commenced to arrive from China, Netherlands, East Indies, India and Australia, owing to the suspension of imports into these countries from the United Kingdom. The value of exports of paint from Japan rose from 70,643 yen in 1913 to 236,484 yen in 1916.

On the other hand, imports of ordinary paint into Japan have been very much reduced, but imports of ship's bottom paint and varnish have increased along with the development of shipbuilding, etc., 356,374 yen's worth of the former have been imported in 1916 as compared with 154,036 yen in 1913, and, as regards the latter, imports were valued at 222,714 yen in 1913, and 278,081, in 1916.

Since the war a number of Japanese paint factories have been extended and several new factories have been built, while others are proposed to be established.

MANUFACTURE OF CHEMICALS AND PAINT.

A company is to be established in Kurume (Kyushu) for the manufacture of industrial chemicals and paints. A share capital of 500,000 yen has been subscribed. From the vegetable wax, of which there are abundant supplies in the neighbourhood, it is proposed to manufacture glycerine, stearine, pitch and soap wax. Other products will be potassium permanganate, potassium carbonate and paint. According to the scheme which has been drawn up, 600 tons of raw materials will be treated per annum, from which 42 tons of glycerine, 420 tons of stearine, 60 tons of pitch, and 60 tons of soap wax are to be obtained.

PROPOSED STARCH FACTORY.

It is proposed to establish a factory at Sapporo (in the Hokkaido) for the manufacture of starch from potatoes and grain. The company responsible for this venture is stated to have a capital of 1,500,000 yen. The estimated annual output of the factory is given as 6,000,000 lb. of first grade and 500,000 lb. of second grade potato starch; and 2,000,000 lb. of first grade and 600,000 lb. of second grade corn starch. This will be an entirely new industry in the Hokkaido.

MANUFACTURE OF LINEN AND JUTE GOODS.

According to a report in the vernacular press, the five plants of a Japanese company are at present working at full capacity and turning out annually 12,000,000 yards of linen cloth and 17,000,000 lb. of yarn. They are manufacturing flax goods only, and some of the plants are being operated both night and day.

A new plant is in course of erection at Shinkoyasu which will be utilised for making jute goods only, the annual output being estimated at 7,000,000 yds. of Hessian cloth, 4,500,000 pcs. of gunny bags, and 1,000,000 lb. of yarn.

WATCH AND CLOCK INDUSTRY.

Before the war the export of clocks from Japan was valued at from 700,000 yen to 800,000 yen per annum. Of recent years the volume of exports has increased as the supply of German clocks was cut off, and in 1916 exports in this line from Japan were valued at 1,180,000 yen. During the last three and a half years Japanese clocks have been exported to China, India and the South Sea Islands, and even to the United Kingdom, France, Italy and the Straits Settlements, and it is believed that some portion of this new trade will be retained after the war.

Latterly, however, clockmakers in Japan have experienced great difficulty in obtaining springs, and this has had a very adverse effect upon the trade. The Japanese manufacturers have altogether 6,000 workers in their employment, and they have been making clocks without springs so that the clocks can be finished and sold as soon as springs are available. There is, however, no hope of obtaining the necessary supplies, and four out of the total of seventeen manufacturers have recently closed down.

It appears that watches are manufactured only by one Japanese firm, although a few other firms are making cases and importing movements and other parts. Prior to the war imports of watches into Japan were valued at about 1,000,000 yen per annum, and this level will probably be maintained for some years to come.

MANUFACTURE OF CHROMIC ACID, ETC.

A firm has been making preparations for the manufacture of chromic acid at their factory at Toyosaki-machi, near Osaka. It is reported that arrangements have now been completed, and that the goods will be placed upon the market in the near future. As regards the supply of raw material, the firm is stated to have recently concluded an agreement for the import of chrome ore from abroad, 4,000 tons at each shipment, as the Japanese ore does not contain a sufficient percentage of metal.

Since the war the firm referred to above has launched out into a number of enterprises, including the manufacture of various chemical compounds and the establishment of dyeworks.

ELECTRICAL INDUSTRY IN 1916.

At the end of 1916 there was a total of 3,744,141 houses lighted by electricity, with 9,035,468 bulbs in use, having a total candle-power of 98,011,153.

The amount of electricity generated for industrial purposes was 624,516 h. p.

There was a mileage of lines for street cars amounting to 892, and the length of telegraph wires was 45,000 miles, while that of submarine cables amounted to 5,900 miles.

The number of telephone exchanges was 1,135, there being 222,516 telephones in use, and 152,911 applicants for the telephone service to be supplied.

A comparison of the consumption of electrical power per head of population in Japan is given as 18 watts, as compared with 164 watts in Germany, and 237 watts in the United States of America.

TRADE OF KHORASAN IN 1916-17.

We quote from the *Board of Trade Journal*:—

The value of the trade of Khorasan in the year ended March, 1917, excluding that through the parcels post, amounted to £3,339,702 as compared with £1,948,798 in 1915-16. The value of the trade through the parcels post rose to £283,694 from £30,282 in 1915-16. In estimating the importance of these figures the decrease in the local value of the rouble and the general increase in local prices must be taken into consideration.

IMPORTS.

The value of imports into Khorasan from India in 1916-17 was £120,239, as compared with £101,734 in 1915-16. The relative figures of imports from Afghanistan and Russia were £142,592 and £41,456, and £1,058,977 and £770,088, respectively.

The increase shown under Afghanistan was in reality an increase in imports from India; quantities of goods which had travelled from India by the Heart route, having been shown by the local Customs Departments as imports from Afghanistan. The Heart route is the trade route to the East *via* Kariz. The distance between the two towns is 231 miles.

It may be observed that the increases in value shown in the return of imports from Russia were in many cases accompanied by a decrease in quantity; the prices of certain articles having risen enormously. Where the reverse is the case, the articles imported were of inferior quality. Certain articles appeared as fresh importations, such, for example, as "window glass;" these were imported to replenish exhausted stocks or in consequence of some prohibition which had been removed. Similarly, a large decrease or, in certain cases, an almost total cessation in the importation of an article represented the result of a prohibition newly introduced.

A drawback of seven-eighths of the Indian Customs duty is allowed on goods exported to Persia, and the North Western Railway allows a rebate of two-thirds, and the East Indian and Oudh and Rohilkhand Railways a rebate of one-third, of the freight on goods for Persia.

EXPORTS.

The value of exports to India by the trade routes fell from £22,357 in 1915-16 to £9,194 in 1916-17, the principal articles which showed decreases being manufactured silk and provisions; but there was a rise of £10,000 in exports to Afghanistan, which includes the value of such articles exported to India by the Afghan route. Exports to Russia increased from £975,356 to £1,968,322, the articles which were chiefly responsible for this being wool, cotton, opium, and dried fruits, all of which were requisitioned in large quantities for military purposes.

THE PARCEL POST.

The only item which calls for special remark is the enormous increase in the value of the opium exported to Russia by parcel post. The price per lb. rose phenomenally and a much larger amount was required for military use.

MYSORE ECONOMIC CONFERENCE. AGRICULTURAL COMMITTEE.

The following is a brief report of work done by the Agricultural Committee, during August, 1918.

Programme.—The subjects approved by the last Conference and entrusted to this Committee for being worked out this year have been distributed among the members and Sub-Committees. The following items have been selected for special attention during the current half year.—

1. Increase of food production, (2) Consolidation of scattered holdings, (3) Development of Agricultural Associations, (4) Expansion of the Agricultural Department, (5) Land Bank, (6) Revision of the Standards of Development, (7) Development of sugar-cane cultivation, (8) Survey of lands suitable for tea, (9) Experimental work in Sheep Breeding, (10) Organization of District nurseries, (11) Sericulture, and (12) Statistics of Agricultural production.

2. *Increase of Food Production.*—A detailed scheme has been submitted to Government for encouraging the increased production of foodstuffs in the State by extending and improving cultivation. The proposals include speedy disposal of *darkhasts* facilities for taking up land for temporary cultivation, utilisation of communal and Government reserves and distribution of seed and implements. The orders of Government are awaited for taking further action.

3. *Consolidation of Scattered Holdings.*—The Deputy Commissioners have been requested for definite proposals with estimates of cost for introducing consolidation of holdings in a selected village in the taluk selected for being made Model in their District. In the meantime, the subject is under study in the light of action taken in other countries.

4. *Standards of Development.*—The Committee are in communication with the Revenue Department for evolving standards of development in each unit area. Certain tentative figures worked out in the Committee's Office have been circulated as a basis for discussion.

5. *Tea Cultivation.*—The Committee are in correspondence with an Agricultural Officer in Ceylon who is reported to be well conversant with the subject, and hope to be able to prepare a definite scheme early in January next.

6. *Pepper.*—The question of encouraging pepper cultivation in the *malnad* is under study.

7. *Live-stock.*—Publicity is being given to the concessions recently sanctioned by Government.

Experimental work in sheep breeding is in progress at Hebbal. 38 ewes recently got from Kolar have been added to the stock.

A report on the condition of pony breeding in the State and the lines on which it should be developed, received from Mr. Mirza Mohamed Mahdi, has been considered by the Committee and recommendations will be submitted to Government to add to the concessions already sanctioned.

8. *Horticulture*.—Appended is a statement showing the kinds and number of trees for which orders have been booked during the current year through the Committee's staff:—

Apples	...	...	5,605
Oranges	...	...	2,244
Limes	...	...	2,661
Cocoanuts	...	...	906
Mangoes	...	...	3,424
Plantains	...	...	130
Pomeloes	...	...	673
Pomegranates	...	...	1,189
Grapes	...	...	180
Citrons	...	...	60
Guavas	...	...	833
Figs	...	...	453
Herale (ಹೇರಳೆ)	...	...	49
Rose apples	...	...	402
Roses	...	...	145
Pine apples	...	...	24
Peaches	...	...	237
Papayas	...	...	135
Champakas	...	...	313
Other plants	...	...	393
			20,056

N. RAMA RAO,
Secretary.

INDUSTRIES AND COMMERCE COMMITTEE.

The following is a brief report of work done by the Committee during the month of August, 1918.

1. *The Mysore Dasara Industrial and Agricultural Exhibition*.—The Exhibition arrangements are well on hand. The President paid a visit to Mysore on the 20th and 21st instants and inspected the progress made, which is satisfactory, and gave orders for further progress.

2. *Programme*.—The programme of the Committee for 1918-19 was fully discussed at the Meeting of the Committee and finally approved. Copies of the same are being printed.

3. (1) *Loans recommended to Government for sanction*.—The applications received from the Director of Industries and Commerce for the grant of the Loan and Hire Purchase advances were

recommended to Government for sanction during the month under report:—

- (a) Loan of Rs. 18,000 to Mr. Narniah of Thallagonda village, Kolar Taluk, for the supply of a 10 Cwt. self-contained Rice Mill under the Hire Purchase system.
- (b) Loan of Rs. 20,000 to Mr. A. Ramanna, Advocate, Mysore, for the installation of a 7 cwt. Rice Mill at Hosagrahar, Yedatore Taluk.

(2) *Loans sanctioned by the Chairman*.—On the recommendation of the Director of Industries and Commerce, the Chairman sanctioned a loan of Rs. 5,000 under the Hire Purchase system to Mr. M. Subbiah of Magadi for the supply of a Rice Hulling Machinery.

4. *Tile Factory at Gubbi*.—The Committee considered the application of Mr. Mahammad Ali, for starting a Tile Factory with Government aid.

The Committee were in favour of recommending to Government, the grant of permission to Mr. Mahammad Ali to take clay from the tank bed free of charge.

5. *Peripatetic Blacksmiths*.—On the recommendations of the District Committees of Chitaldrug, Mysore, Shimoga and Tumkur for the continuance of the services of the Peripatetic Blacksmiths working in the Districts, the Committee resolved that the existing arrangements be continued till the end of 1918-19.

6. *Monopoly to collect Corundum in the State*.—On a reference received from the Secretary, Economic Conference, the question of granting license to Mr. Manickavelu Mudaliar to collect corundum in the whole state for 10 years was fully considered by the Committee. The Committee resolved that the prayer of the applicant should not be granted.

7. *Mineral Survey*.—The Committee have recommended to Government a Mineral Survey of the State.

8. *Extension of Apprentice Course*.—On the recommendation of the Director of Industries and Commerce, the Committee extended, by another year, the term of C. A. Mascarenhas, Mysore apprentice, undergoing training in the G. I. P. Workshop, Bombay, on a scholarship of Rs. 50 per mensem.

9. *Loan to Messrs. Yernool Venkatarayappa and others of Chennarayapatna*.—The petitioners applied for a loan to improve their Rice Mill. The Committee resolved that the required machinery might be supplied to the petitioners under Takkavi Loan rules if they were prepared to deposit one-fourth of the preliminary purchase money.

10. *Local Production of War Materials*.—A Sub-Committee consisting of 6 members was constituted to advise the Controller of Munitions regarding the measures to be adopted for stimulating the local production of war materials.

11. *Award of Scholarship*.—The Sub-Committee for grant of scholarships met on the 24th August 1918, and have sent up their proposals to the Central Committee for approval.

M. N. BALA RAJ URS,
Secretary.

DEPARTMENT OF EDUCATION.

Upwards of forty troops have been registered and nearly six hundred boys have been enrolled as members of "The Boy Scouts of Mysore."

The Director of the Boy Scouts of Mysore, recently returned from an extended trip through the north-western part of the State where he found Scouting in a most healthy condition. Troops were visited at Tumkur, Chikmagalur, Shimoga, Chitaldroog, and Davangere, and at each centre large public meetings were held for the purpose of forming local committees to manage the local affairs of the scout organization.

"Juvenile Journalism" is the name the Inspector-General of Education gives to the latest development of Boy Scout work in the State. During the past few weeks the following manuscript magazines dealing with all sorts of topics of interest to boys and especially to Boy Scouts have made their appearance: The "National High School Boy Scout Magazine," (9th and 10th Bangalore Troops) "Brotherhood," (6th Bangalore Troop) and "The Young Scout," (4th Bangalore Troop). All are cleverly planned and conducted by the boys themselves under the guiding eyes of their Scout Masters. They promise to serve a real purpose in developing scout spirit as well as literary talent.

One of the members of the 6th Bangalore Troop recently had a real opportunity of putting to use the little knowledge of First Aid to the injured he had gained in his scout class. A workman in the city fell from a tree and sustained a fracture. The boy ran to the rescue, made the sufferer as comfortable as he could, put a temporary dressing on the wound and made arrangements for his transportation to the hospital. This "good turn" is only typical of hundreds the Boy Scout of Mysore are doing every day. It is one of the first duties of a Scout to endeavour to make the world in which he lives a little happier, and Scouts have learned that their own greatest happiness comes from making other people happy.

FRANK C. IRWIN,

Director,

The Boy Scout of Mysore.

PROGRESS IN THE DISTRICTS.

Chitaldrug.

AGRICULTURE.

A Sugar-cane Growers' Association.—A Sugar-cane Growers' Association was started at Bhima-samudra.

Improved Implements.—Nine improved implements, thirty-six plough-shares and four other implements were introduced.

A Cattle Breeding Farm.—Mr. Venkatappa of Bharmasagar, Challakere Taluk, has applied for fifty acres of land and a loan of Rs. 1,500 for starting a Cattle Breeding Farm.

EDUCATION.

Reading Rooms and Libraries.—Four Reading Rooms and Libraries were newly started in the District.

Collection of Funds.—A sum of Rs. 1,658 was collected for educational purposes.

Opening of Schools.—Three boys' schools, one girls' school, one night school and three Panchama schools were newly opened in the District.

Shimoga.

AGRICULTURE.

Grant of Scholarship.—The Committee resolved to grant a monthly scholarship of Rs. 10 for a period of one year to one Krishna Murthi undergoing training in the Hebbal Agricultural School, Bangalore.

EDUCATION.

Opening of Schools.—A Hindi Adult School was started at Hole Honnur, and a night school at Ittigehalli. Two Boys' schools and one Panchama school were also started in the Sagar Taluk.

Construction of a School Building.—A sum of Rs. 134 has been collected towards the construction of the V. E. school building at Chikka Jogihalli.

Libraries.—Libraries have been opened at Kumsi, Ayanur and Harnahalli.

Teachers' Conference and Educational Exhibition.—The question of making the Teachers, Conference and Educational Exhibition an annual function along with the Taluk and District Conferences was discussed in all its aspects and the Committee resolved to send their recommendations to the Inspector-General of Education.

INDUSTRIES AND COMMERCE.

A Home Industries Class.—A Home Industries class in rattan work was opened at Sagar since 1st May last.

Branch of the Mysore Bank.—The Committee resolved to recommend the opening of a Mysore Bank Agency at Nyamti which is one of the biggest trading centres in the District.

Improving a Soap Factory.—The Committee resolved to sanction a loan of Rs. 200 applied for by Atchutha Pandit of Sagar for improving his soap factory at Sagar.

The Gudigar Society.—The Committee resolved that necessary recommendations be sent up in accordance with the District Economic Superintendents' memo for improving the work of the Gudigar Society at Sagar.

GENERAL.

Work for 1918-19.—Working Sub-Committees were appointed for Agriculture, Education, Industries and Commerce, and Co-operation for the year, 1918-19.

A Co-operative Society.—A Co-operative Society was started at Basavanandihalli.

CORRESPONDENCE.

To

The Editor,

Mysore Economic Journal, Bangalore.

Wood Distillation Plant.

Sir,—Our plant is of the most improved design and has been thoroughly approved in practice, and is similar to that supplied in connection with War Office requirements. Particular attention is given in the design to ease of operation, long life of each piece and high yield of product. The plant is supplied complete, ready to set on required foundations and in the necessary buildings.

The nature and amount of products to be expected per cord of 128 cub. ft. of wood, with the average normal prices for same in England, are as follows:—

- (1) Charcoal, 900 to 1,000 lbs., £2'10/- per ton.
- (2) Grey Acetate of Lime, 180 to 220 lbs., £9'10/- per ton.
- (3) Refined Wood Naphtha, 5 to 7 gallons. £3/- per gallon.
- (4) Methy. Acetone, 2 to 3 gallons., 3/- per gallon
- (5) Hard Pitch, 150 lbs. £2'10/- per ton.
- (6) Wood Creosote Oil, 5 gallons., 10d. per gallon.
- (7) Light Wood Oils, 2 to 3 gallons. 10d. per gallon.

The labour required for operating a sixteen cord plant is in England about eighteen men, ten of whom are common labourers at approximately 20/- per week, and five are more skilled men at about 35/- per week, with the balance as Foremen at £2 stg., per week. One Superintendent operates the plant and usually received a salary of about £200 stg., a year.

The fuel required is approximately forty tons per week of coal, half of which is ordinary "Slack" and the other half, Steam Coal. Depreciation and repairs are usually charged at about 8 per cent on the whole plant.

The method of operation may be outlined roughly as follows:—The air-dried wood from the forests is piled into steel trucks in 4 ft. lengths, each truck holding approximately two cords, and the trucks are wheeled into horizontal steel retorts which are sealed up by means of doors so that they are air-tight. Heat is applied by means of fire underneath them and the temperature raised until the wood is decomposed and the various products are driven-off in the form of gases. These gases are passed out of the retorts through outlets, and into condenser where the valuable products are condensed and

drawn off, the non-condensable gases passing away through the scrubber, to clean them, and led under the retorts where they are used as fuel. The crude liquor from the condensers is settled in a series of Wooden Vats where the tar separates out and a watery liquor is drawn off the top. This watery layer is distilled to free it from dissolved tar, and the watery acid, containing wood naphtha, acetone and oils is neutralized with lime, forming the Acetate of Lime solution. The lower layer in these settling vats composed of tar containing some acid, is also drawn off and distilled separately, where the acid, naphtha and so forth, is recovered in the same manner and neutralized. The tar from both these distillations is removed to a steel Tar Still, where it is distilled by fire, producing Creosote oil and Pitch. The neutralized liquor, containing Acetate of Lime, Wood Naphtha, etc., is then distilled in a Lime Lees Still, where the naphtha and Acetone are removed, the Acetate of Lime remaining in the liquor. The naphtha and acetone, along with the light oils, are then rectified in a Rectifying Still, which produces highly refined Naphtha, Acetone and Oils. The residual liquor from the Lime Lees Still is then evaporated to crystallizing point, when it is transferred to Drying Pan on top of the retort, where the Acetate is dried to a mush. This mush is then thrown on top of the retort on a special kiln-drying floor heated by the waste gases from the furnace, where it is kiln-dried, ready for shipment. The residue left on the steel trucks in the retorts in Charcoal, which is withdrawn at the end of the distillation into air-dried cookers it remains for twenty-four hours until the next charge from the retort is withdrawn, when it is ready for market, in large lumps.

The whole circle of the process usually occupied from twenty to twenty-four hours, depending on the condition of the wood as to dryness, etc. This condition also has quite an effect on the yield of products obtained, wet wood requiring more fuel for distillation and yielding smaller amounts of products per cord, on account of the decomposition in the retort caused by the presence of moisture.

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No. 10

THE REVOLUTION IN EDUCATION: OUR SECONDARY SCHOOLS FOR BOYS.

BY R. F. CHOLMELEY, M.A.,
Of Owen's School, Islington.

IT is nearly forty years, as Lord Haldane has reminded us, since we were exhorted by Matthew Arnold to organize our secondary education. We have not done it; and the need which Arnold saw is the chief need of to-day. Elementary education has been organized—not that it is by any means perfect, but it has a system, making progress possible: University education has developed and is developing with a stir and spirit that justify the brightest hopes; secondary education, for all that has been done—and much has been done, in spite of difficulty and discouragement—remains the weakest link in the chain; and until we have seen to it we cannot have an educational system that will do what an educational system ought to do—*make us an efficient people.*

It is not difficult to see why Arnold's appeal failed; and the reason is worth considering, because if we are to succeed where he and many others did not, we must avoid the error which blunted the edge of their efforts. That reason is that secondary education was talked of in terms of a decaying superstition—the superstition of the middle-classes. The error may have been inevitable, but it was fatal. To talk of education in terms of social classes at all is unfruitful; to

talk of middle-class education is the surest way to lose the attention of every man of spirit. We have only to try to imagine a public meeting called in some large city, such as Birmingham or Manchester, to hear a public man, such as Lord Haldane, appealing for the education of the middle-classes. No one would go—not that there is no middle-class of people, but that there is no such thing as a middle-class spirit. When Gilbert, in one of his most popular songs, used the refrain "Bow, bow, ye lower middle-classes," he hurt nobody's feelings, just because there was no *corporate* feeling to be hurt.

THE NATIONAL NEED.

The only motive worth appealing to is a national motive; so far as secondary education can be shown to be a national need, we can appeal for the right development of it with some chance of success, and with a clear conscience; and who will deny to-day that it is a national need? Is there a greater need than the development of the national intelligence, and is there a more disquieting fact than the fact that only one child in twenty-three goes on from our elementary schools to some higher education? That is the meaning of the demand for the organization of secondary education—not the education of a class, but the education of an age; it involves some revision of our habits of thought, but just as elementary education, which began as an institution for the working class, made real progress only when people began to think of it in terms of childhood in general, so secondary education will

never come to its own until we have got rid of the habit of thinking of it as the education of a particular class and have acquired the habit of treating it as the education of a particular age. The question that we have to ask ourselves is, what are we doing, and what ought we to do, for the children of the nation as they are growing up?

That is the only sort of question in which we can expect or ought to expect the nation at large to take an interest; if it be objected that it is a far wider question than any to which secondary schools in the ordinary sense can provide an answer, the explanation is that no single type of school or kind of teaching can supply the whole answer, because the essence of the question is that it requires not one answer, but several. The fact which lies at the back of the whole problem is the fact that children up to thirteen or thereabouts can be educated more or less on the same plan: after that age comes the time for differentiation. Secondary education as a system has to take account of the general need for differentiation; secondary schools in the ordinary sense aim at supplying part of the general need, and the question for them is what part of the general need can be supplied by one recognisable type of school, and under what conditions that type of school can be made efficient for its purpose.

THE PRESENT SUPPLY.

The type which we generally have in mind when we speak of a secondary school is fairly if somewhat dryly described in the Regulations of the Board of Education as offering "to each pupil a progressive course of instruction (with the requisite organization, curriculum, teaching staff, and equipment) in the subjects necessary to a good general education, upon lines suitable for pupils of an age-range at least as wide as from twelve to seventeen." The origin of this type is to be found in the old grammar schools; its modern history dates from the revolutionary change which the combination

of grants from public authorities and the freeplace system introduced into all schools except those to which the patronage of well-to-do parents secured financial prosperity, sometimes with and sometimes without the aid of endowments. The Act of 1902, which authorised local authorities to spend as much as the produce of a 2d. rate on higher education, gave a considerable though a very unequally felt stimulus to secondary schools; old schools were put on a new footing, new schools were founded for both boys and girls—mixed schools were founded too often without any particular conviction except that they were cheaper; and there are now some 800 secondary schools in England receiving annual grants from the Board of Education and in most cases also from local authorities. These are the only secondary schools that are under any sort of State control; in 1912 there were 84 of them in London, 89 in Lancashire, 111 in Yorkshire, but only 11 in Suffolk, 8 in Norfolk, and—as might be expected—1 in Rutland. All the rest are either independent public schools or independent private schools; the number of private schools professing to give secondary education is unknown but is certainly very large and probably amounts to several thousands. Lord Haldane is surely right in saying that "the quantity of secondary education, properly organized, and organized by the State, in this country is almost negligible."

EDUCATION AND LIFE.

One thing, then, that is needed is an increase in the quantity of secondary education; we want more schools. We do not necessarily want them all of the same type; in fact one of the most important and most interesting questions in this connection is the question how much variation is possible within the type to which the name of secondary school answers, and in what cases a different type is required. The Board of Education have already begun to experiment upon this question by the publication in August, 1913, of Regulations for New

Junior Technical Schools; and apart from this a great deal is being done to adapt the curriculum of secondary schools to the character of the district in which they are situated. We have begun to realise that without throwing over the idea of "a good general education," we can and must bring that idea into closer relationship with the lives of those whom we desire to educate; and that realisation is one of the most hopeful signs of the present revival of interest in education. Indeed, without it no revival of interest would have been possible; so long as schools were dominated—not perhaps consciously, but effectively—by the idea that to bring the ordinary facts of life into their teaching was to degrade that teaching into a mere apprenticeship to some kind of business, people who were interested in and efficient at every kind of business, and who wanted their children to be the same, had every excuse for regarding schools as essentially frivolous places of which the best that could be said was that they kept the children out of mischief till they were old enough to get sense. And the natural consequence was that so soon as the children showed signs of getting sense, they were taken away from school and given something serious to do. To write of these things in the past tense may seem unduly optimistic: no doubt it is; yet one of the methods of making people better is to assure them that they are not so bad as they were, and perhaps even this dash of optimism may have a moral value.

THE STATE TO THE RESCUE.

We want more schools, and we want them adapted to the lives of those who will come after them. We want schools which shall be really centres of civilisation in the places where they are; but in order that schools may do the work that they ought to do we must have a supply of teachers adequate in numbers and in qualifications for that work; and this under the present financial conditions is the most difficult thing of all to pro-

vide. I see but one way out of the difficulty. At present the whole burden of providing for the steady increasing cost of secondary and elementary education, which arises from the demand for properly qualified teachers, falls upon the local authorities. The Board of Education grants, based upon the attendance of pupils, cannot in the nature of the case keep pace with that demand; in fact the published statistics of local authorities and of the Board itself, show not merely that the State grants do not increase in proportion to the needs of the schools, but in some cases that they actually decrease, while the burden cast upon local authorities increases by leaps and bounds. And the burden of providing for the cost of *teaching power* by salary scales and pensions, sufficiently liberal to attract the kind of a teacher that is wanted, is precisely the burden which local authorities almost everywhere find most intolerable. "The Englishman," said Lord Crewe in a memorable passage, "pays his taxes in sorrow, but his rates in anger." If we want to secure for the nation not merely a sufficient supply of schools, but a sufficient supply of qualified teachers, we must bring the whole force of the national resources to bear upon the satisfaction of that want. We must use the one general weapon that we have to our hands, the State grant, in order to raise the standard of teaching power throughout the country. I do not care whether anybody says that this would make teachers into Civil servants, or not. Whether a man is a Civil servant or not, and what precisely are the responsibilities and disabilities attaching to his position as a Civil servant, depend upon all the conditions of his service, and not upon one only, even though that one be the supremely important one of the origin of his remuneration. What I do feel sure of is that a system of secondary schools, fitted to the life that surrounds them, managed—as all schools should be—by governing bodies of spirit and sympathetic understanding, each forming an organic part of the educational scheme of a local authority, and all supplied by *means of National Grants*, with the one sort of equipment that matters, the equipment of competent teaching staffs, would in a generation *transform* the mental, moral, and physical vigour of the English people.

The only question for us is—Do we care enough about the next generation?

THE HIGHER EDUCATION OF ADULTS.

BY R. H. TAWNEY, B.A.,

Of the London School of Economics.

THERE is no more significant feature in the educational renaissance of the last ten years than the demand for education of a university character among the adult working people which has produced the Workers' Educational Association and its system of tutorial classes. The educational importance of that movement does not lie only in the high intellectual quality of the work done under its auspices; nor even in the spirit of co-operation and comradeship in which the classes are carried on. It lies rather in the fact that, whereas hitherto educational reforms in England have usually been pioneered, at any rate, from above, at one time by the churches, at another by the Universities, at another by Whitehall, the Workers' Educational Association represents a demand on the part of working men and working women to be supplied not with the education which is thought good for them by those in high places, but with the education which they themselves desire, and supplies a democratic organization by which that demand can be fostered and expressed.

A DEMOCRATIC ORGANIZATION.

The Association was founded in 1903 through the enthusiasm of a small body of co-operators and trade unionists, who were convinced that if the demand for higher education had hitherto been little heard among working people, the reason was not that it was non-existent, but that it had no adequate vehicle of expression. They believed that until the workers voiced their own wishes all schemes of higher education devised for them by academic authorities were predestined to barrenness. They set themselves, therefore, to create

a force which should, in the first place, stimulate and express the working-class demand for higher education; and which should, in the second place, co-operate with the educational agencies by which that demand could be met. The result of their enthusiasm was the foundation of the Workers' Educational Association. The Association is non-political, all persons and societies of every complexion, conservatives, liberals, and socialists are found in its ranks. It is unsectarian, and it is democratic—for any individual can become a member of the Central Association on payment of 2s. 6d. and any society on payment of one guinea, while the societies affiliated to branches usually pay less; every member has one vote and one only; the policy of the society is determined by its annual meeting; and the government of it is in the hands of a council consisting of representatives of the districts (in which the branches are grouped) the affiliated societies, and the individual members. In the year after the Association was founded it had one branch and some twenty affiliated societies. At present it has 158 branches and 2,164 affiliated societies, which include 781 trade unions, trade union branches, and trades councils, 326 co-operative committees, 284 adult schools and classes, 20 universities and university bodies, and 15 local education authorities.

THE AIMS OF THE ASSOCIATION.

Throughout its career the Association has been guided by three ideas. First, the education offered to the workers must be such as they themselves demand: it must be supplied by bodies on which they are or can be represented, and they must have perfect freedom of opportunity in expressing their wishes. Second, the education with which it is concerned is not technical education, but "humane" education or "culture:" call it what you will, the meaning is clear enough. Technical education is provided by local authorities,

and there is little need now to emphasise its importance. Humane education is not provided by them, and it is very much more important. "Important for miners and engineers, weavers and general labourers to study history, economics, and literature?" Certainly, men and women are not productive tools. They are men and women, and the education which they need is the education which develops not merely their professional skill, but their powers of reflection, their sympathy, insight and imagination, which makes them better citizens and better individuals. Third, the workers want education as workers, and not in order that they may cease to be workers and become something else. English education has been in the past obsessed with what may be called the "ladder theory" of education, the idea that all that is needed is to provide a scholarship by which clever boys may climb to the university and leave their own people behind them. But the chief characteristic of a ladder is that only one person can go up it at a time and that those at the top are very far from those at the bottom. The Workers' Educational Association stands for a different conception of education than that. What the workers desire is not that men should escape from their class, but that they should remain in it and raise its whole level. What the Association provides is a means whereby that ideal—surely a noble one—may be realised. Those attending classes and lectures are in ninety-nine cases out of a hundred manual workers, and in ninety-nine cases out of a hundred will remain manual workers to the end of their lives.

THE PRACTICAL WORK OF THE ASSOCIATION.

This, it may be said, is all very fine. But what has the Association done? What it has done is to co-operate with working-class organizations, with the universities, with local education authorities, and with the

Board of Education in establishing classes and lectures all over the country. A Conference is held in a town, to which all organizations are invited to send delegates, and, if the Conference approves, a branch of the Association is formed. When a branch has been established its first task is to discover the educational wishes of its members. If they wish to have a course of classes or lectures on a certain subject, it is the business of the branch secretary to arrange them. There is no overlapping with the work of education authorities or of other organizations. But if the demand cannot be met locally, the branch communicates with the secretary of the district, and, if enough students are forthcoming, he finds means of providing them with a teacher. The best known side, though only one side, of the Association's work consists in establishing "tutorial classes." These consist of groups of about twenty-five to thirty students, who agree to meet regularly, unless prevented by unavoidable obstacles such as illness or overtime, for twenty-four evenings during each of three years. The teacher is appointed by a University Joint Committee, consisting of an equal number of representatives of the University and of Labour organizations (there is a joint-committee now at almost every University in England), and he is paid partly by the university, partly by grants from the Board of Education aided, often, by grants from the local education authority. The subject of study is chosen by class. Each meeting lasts for two hours, the first hour consisting usually of a lecture, the second hour consisting always of a discussion by members of the class, who are asked, also, to write short essays.

UNIVERSITY EDUCATION.

What is the value of such a system? It has certainly met a genuine demand for humane education among adult men and women. The first two classes were established in January, 1908. There are now

146 classes with between 3,000 and 4,000 students. Again nearly all the students are "workers" in the strictest sense of that word. The latest figures are not yet available. But turning to those for the year 1911-12, I find that among 2,382 students there were 188 textile workers, 184 miners and quarrymen, 148 metal workers, 139 printers, 138 engineers, 89 carpenters and joiners, and numerous other craftsmen. And what of the quality of the work done? The classes now deal with a considerable range of subjects. The majority start with industrial history, economics, or political science, but many of them go on to literature, and some to philosophy and natural science. The work done was pronounced by the inspectors, Mr. Headlam and Professor Hobhouse, who were sent by the Board of Education to inquire into the classes, to be of university level. Speaking as one who has taught tutorial classes for some years, and who has also lectured and examined in universities, the writer of this article is quite satisfied that the tutorial classes are an educational instrument of quite unique value. The students who join them do so not because they want to "get on," but because they want to get knowledge for its own sake. They are nearly always men and women of more mature years than the ordinary undergraduate in a university. They are prepared not merely to listen to lectures, but to read and think for themselves, to shed prejudices and conventions, to go to sources and to test accepted theories. If this is not university education, what is? And the effect of the classes does not cease with their influence on the growing number of men and women who actually join them. For the students themselves spread a faith in the possibilities of education among those with whom they work and mix: indeed many of those who have been through tutorial classes, teach preparatory classes themselves. Thus the movement contains the germ of a system of higher education at once accessible, thorough, and inspiring, which will strengthen all sides of English educational effort by the faith in education which it spreads. No money is better spent than that which assists the humane education carried on in the tutorial classes of the Workers' Educational Association.

AGRICULTURAL INSURANCE— FINANCIAL RESULT.

BY DIWAN BAHADUR J. S. CHAKRAVARTI,
M.A., F.R.A.S., &c.

IT would be interesting to work out in detail the financial result of the working of the Scheme of Agricultural Insurance for a number of years in the Mysore State. As the actual financial result depends on the rainfall it is not possible to make any such calculations with reference to the future. But it is quite easy to find out what the result of the scheme would have been if it had been in operation for a number of years past in any particular taluk or district or in all parts of the State. In this article it is my object to arrive at such a result for a period of ten years, 1898-07, in respect of all the taluks of the State. This will enable us to form a correct idea of the extent of risk which the State may be regarded as taking in giving a trial to the scheme.

Before the financial results can be worked out in the way suggested above we must make an assumption as to the extent to which the scheme may be held to have been in operation during the period. It will be easily understood that if the scheme be held to have been very popular during the period so that almost all fields were insured, the scale of operations would be very large and the resulting gain or loss to the fund at the end of the period one of vast magnitude. In our scheme the annual insurance premium has been taken equal to the annual assessment. The annual assessment of dry, wet and garden lands for the whole of the Mysore State including those within Inam villages being nearly a crore of rupees, the magnitude of operations in a scheme of Agricultural Insurance so popular as to be nearly universal will be very large. Premium receipts would amount to more than 100 lakhs per annum

and the payments on account of compensation in a very bad year would be 300 or 400 lakhs and may in the worst case of a failure in both the January—July, and January—October periods amount to as much as eight crores of rupees. On the other hand, if for purposes of calculation the scheme be assumed not to have been popular during the period in question so that there were only a few policy holders here and there, the financial operations in connection with the scheme would be on a very small scale and the resulting debit or credit balance of the fund at the end of the period would be small. It must be admitted that for many years at the beginning, the actual state of affairs would more nearly approach the last mentioned state of affairs than that referred to first. People of the ryot class will be convinced of the usefulness of insurance only by slow degrees. But to gauge the financial results of the scheme with the view of ascertaining the risk undertaken by the State as regards incurring a debit balance of considerable magnitude, it would not be

right or safe to assume a very restricted degree of currency of the scheme. The scheme must be safe and must not at any time involve to incurring of a debit balance beyond the capacity or convenience of the State even if it attains a fair measure of popularity. For these reasons, I shall assume for purposes of calculation in this article that 25 per cent of lands of all classes were insured under the scheme during the fifteen years to which the calculation relates.

The rate of interest which can be earned on the funds of the scheme will be assumed to be 4 per cent per annum.

On the basis of the foregoing hypotheses talukwar tables have been prepared shewing the financial results which would have followed from the Agricultural scheme if it had been in operation from 1st January, 1898, to 31st December, 1907. The principles adopted in preparing these tables will be clear from the following specimen table relating to Bangalore Taluk.

Financial Results to the State of the Agricultural Insurance Scheme if it had been in force from 1898-1907.

Bangalore Taluk.

Year F 1 means failure of rain during January-July pe- riod and F 2 during Jan- uary-October period.	Opening balance	Premium receipts † of (Dry + Wet & Garden assessment.)	Compensation paid.			Interest addition 12b-9c-5d-2e. 300	Balance at the end of the year.	Remarks.
			January to July	January to October	Total			
a	b	c	d	e	f	g	h	i
1898 F 1 ...		34823	139292	...	199292	-1276	-105745	
1899 ...	-105745	34621	...	...	...	-3191	-74315	
1900 ...	-74315	34461	...	...	...	-1938	-41792	
1901 ...	-41792	34181	...	...	...	-646	-8257	
1902 ...	-8257	34269	...	...	...	697	26709	
1903 F 1 ...	26709	34446	137784	...	137784	-194	-76823	
1904 ...	-76823	34413	...	...	...	-2040	-44450	
1905 ...	-44450	34399	...	...	...	-746	-10797	
1906 ...	-10797	34399	...	...	...	600	24202	Figures for 1906 not being available
1907 ...	24202	39342	...	...	...	2148	65692	1905 figures are taken.

The only point which requires any explanation in connection with these tables is the calculation of interest in column (g). The interest for any year is arrived at thus: As fresh premia are payable on any date up to 31st March, it is safe for purposes of calculation to neglect any small interest on premia which may be paid before that date. So for the months from January to March, interest is calculated only on the opening balance. This gives the product 3b. From April to July interest will accrue on the sum of the opening balance and the year's premia. This gives 4 (b+c). From August to October interest accrues on the balance at the end of July minus any amount which may have been paid as compensation for the January-July period. This gives 3 (b+c-d). During November and December interest accrues on the balance at the end of October minus any amount which may be paid as compensation for the January-October period. This gives 2 (b+c-d-e). These products are month rupees. Adding them up, we get their sum thus:

$$\begin{array}{r}
 3b \\
 4b + 4c \\
 3b + 3c - 3d \\
 2b + 2c - 2d - 2e \\
 \hline
 12b + 9c - 5d - 2e
 \end{array}$$

The interest on 100 rupees for 12 months being 4 rupees, the interest on a month-rupee is $4/1200$ or $1/300$. The interest therefore

$$\begin{array}{r}
 12b + 9c - 5d - 2e \\
 \hline
 300
 \end{array}$$

The premium receipts are taken as one-fourth of the assessment of the taluk on dry, wet and garden lands on the assumption referred to above that one-fourth of the lands were insured.

The sixty-eight talukwar statements have then been grouped districtwar in separate tables bringing at the result in each district.

Finally the district balances have been tabulated in one statement bringing out the financial result of the working of the scheme throughout the whole State during the ten years in question. This table is given below:

Financial results to the State of the Agricultural Insurance Scheme if it had been in force in all the Districts of the Mysore State from 1898-07.

Districts.	Net Receipts.	Net outgoings.	Net results. Receipts or outgoings.	Remarks.
Bangalore.	2,781,218	1,706,928	1,074,290	
Kolar ...	3,370,649	1,512,096	1,858,553	
Tumkur ...	2,914,316	2,301,196	613,120	
Shimoga...	3,277,151	1,400,470	1,876,681	
Kadur ...	1,917,557	1,109,143	808,414	
Chitaldurg	1,989,260	1,153,580	835,680	
Mysore ...	4,524,819	3,617,326	907,493	
Hassan ...	3,046,823	9,527,85	2,094,038	
Total for the State.	23,821,793	13,753,524	10,068,269	

The foregoing tables shew that the net result of ten years operations of the scheme on the basis of 25 per cent of all wet and dry fields and gardens being insured would have been as follows:—

Total premium receipts	Rs. 217,60,260 *
"Interest"	Rs. 20,61,533 *

Total receipts ...	Rs. 238,21,793
Deduct premia payments	Rs. 137,53,524

Balance	Rs. 100,68,269
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In other words, a sum of 100 lakhs would have accumulated as a balance in favour of the Agricultural Insurance fund. It is hardly necessary to state that no part of this amount could be regarded in the light of profit; the period under consideration being somewhat more favourable than average the receipts are in excess of the disbursements. The balance accumulated in this way will, in the long run, be swept away in adverse years in which a much larger sum than the premia receipts will have to be paid as compensation. It is also clear from the statement that during the decennium in question a sum of over 137 lakhs would have been distributed as compensation to ryots.

The financial results as here worked out are satisfactory shewing that at the end of a decade of operations, the fund would have been in a strong position to meet any demands that might arise on account of compensation and that adequate compensations would have been paid in all cases coming under the rules during the whole period.

* These figures can be arrived at only from the details of the Talukwar tables.

CO-OPERATION IN BOMBAY, 1917-18.

BY "RUSTICUS."

SOME two years ago, Mr. Ewbank, the Registrar of Co-operative Societies in Bombay, in an article on Co-operation in India in the *Quarterly Review*, which we reviewed at length in these columns, showed that he had a ready pen and, though his annual Reports offer less scope for its exercise, they are always well written and of great interest. That interest, we would remind Mr. Ewbank, is but purely local. In these days, there is, all over India, an increasing number of keen co-operators who are anxious to learn about the latest developments outside their own provinces. A word of explanation here and there in the Provincial Reports would be a great help to them. For example, Mr. Ewbank tells the (patidars) Government of Bombay that the capacity of the Patidars of Southern Gujarat for co-operation is unquestionable but that the kaliparaj classes on the other hand can only manage their societies successfully after long training. It is, no doubt, perfectly clear to all Mr. Ewbank's readers in the Bombay Presidency why this should be so but it will be clear to no one outside it. Mr. Ewbank might have told us who the patidars and kaliparaj classes are and why the one should produce better co-operators than the other. We may remark, in passing, that the Bombay Government appear to share the mistaken view that no one outside Bombay had any desire to know how co-operation is progressing in that Province. On no other supposition can we account for the fact that it took them about exactly nine months to review the Report.

In 1915-16, the distinctive mark of the co-operative movement in Bombay as in most other Provinces was consolidation. Time, assisted by the war, had revealed

weak spots which needed repair. The rapid progress made in Bombay in 1916-17 showed the wisdom of this course. Had it not been taken, the difficulties which the movement had to face in that year would not have been so triumphantly overcome. In the first place, the general stringency in the money market and the competition of the War Loan sent deposit rates up and not only reduced the margin of profit earned by Central Banks but also, in some cases, drained away local deposits from primary societies. In the second place, recruitment for the war and the high wages obtainable in Bombay affected the numerous societies in the sugar-cane districts which depend on outside labour for boiling their jaggery. Then, again, severe plague in the Deccan and untimely rains, which brought down mud houses by the thousand, severely handicapped very many societies. In these circumstances, it says much for the energy and enthusiasm of Mr. Ewbank, his staff and the large body of honorary workers he has gathered round him, that the number of societies in the Province should have increased by 27 per cent, the number of members by 22 per cent, and the amount of working capital by 26 per cent. In order to gauge the stability of the movement, one turns to other figures, those of reserve funds and of overdue arrears, and studies more especially the figures for agricultural societies, for these still represent the vital element in co-operation in India. Unfortunately in the case of agricultural societies the figures for reserve funds in 1916-17 are rendered valueless for purposes of comparison by the adoption of a new system of calculating profits. Interests earned and actually recovered is now alone taken into account, that earned but not yet due for recovery being excluded. This is an eminently sound system of accounting but it will be obvious that it makes for a reduction in profits and consequently a reduction in the amount carried to reserve for the year in

which the change takes place. No further explanation of the fact that agricultural societies in Bombay only added Rs. 8,000 to their reserves in 1916-17 is therefore required. Non-agricultural societies, on which the same limitation was not imposed, owing to the necessity of maintaining a steady dividend, increased their reserves by just over Rs. 40,000 or about 28 per cent. In both cases, the figures of overdue arrears were distinctly satisfactory. Of the total demand outstanding, in the case of agricultural societies, only Rs. 304 lakhs or 7 per cent was reported as overdue. There is very little cause for complaint here, even if it be the case, as Mr. Ewbank surmises, that the percentage is really larger than this and that overdue arrears are frequently disguised by the grant of extensions. The position of non-agricultural societies was even stronger as only Rs. 2.1 lakhs or about 6 per cent of their outstanding demand at the end of the year had been overdue for more than two months. The Central Banks have yet to build up a reserve fund at all commensurate with their transactions. That of the Bombay Central Bank is only Rs. 16,814 although its paid up share capital is Rs. 6,98,070. But striking evidence of the light in which it is regarded by the best financial authorities is furnished by the fact that it has recently been granted a cash credit of Rs. 4 lakhs by the Bank of Bombay at one per cent below bank rate.

One feature of the co-operative movement in Bombay last year which is worth not only of special mention but also of imitation, was the investment of no less than Rs. 4½ lakhs by 375 societies in the War Loan. This was not a case of patriotism combined with profit for the societies in Bombay are not yet in the happy state of some of those in the canal colonies of the Punjab and have not refused deposits because they have more money than they know what to do with. Few of them possess even

sufficient capital to satisfy the genuine needs of their members.

Bombay has now twenty-two guaranteeing Unions. The main feature of these Unions, in the establishment of which in India, Burma led the way, have been more than once described in these columns and it is therefore unnecessary to say more than that their object is to provide efficient and responsible local supervision and, by so doing, to relieve the staff of the Co-operative Department and the Central Banks of detailed local duties. The expansion of the staff of the Department has certainly not kept pace with the growth of the material and in every province, it is being found, in an increasing degree, that some part of the work of supervision must be undertaken by societies themselves. The experience of these Unions obtained in Bombay should prove of special value just now for it would appear from the recent report of the proceedings of the Registrars' Conference at Simla that all provinces do not look upon them with equal favour. The first essential to their success is, as Mr. Ewbank justly points out, restricted area. There can be no effective guarantee under the members of the Committee of each society in the Union have an opportunity of making themselves familiar with the working of every other society. As was to be expected, Dharwar, which is one of the most advanced districts in India from the co-operative point of view, has the best Unions. We anticipate that, in his next report, Mr. Ewbank will be able to throw valuable light upon the working of the Unions and on their suitability to conditions in India.

In stating that the favourable terms on which loans have been granted in previous years by the Bombay Provincial Bank, though very advantageous to primary societies, have had the unfortunate effect of stunting the growth of District Central Banks, which have not been able to raise funds that could be advanced to societies

on similarly easy terms, Mr. Ewbank raises a very interesting and important point. The restriction of credit by the Provincial Bank last year made it possible for the first time to organize local Central Banks in Bombay with a reasonable chance of success. Mr. Ewbank points out that the absence of such banks meant that the deposit capital available in mofussil head-quarter towns was not being tapped and that societies were being fed with Provincial Bank money rather than with local money. He admits that this was a distinct flaw in the movement and we should have been glad to see the question discussed at greater length. The logical inference is that the establishment of the Provincial Bank was somewhat premature and that the local Central Banks should have come first. What will be the position of the Central Banks when more normal conditions are restored and the Provincial Bank is in a position to grant loans to primary societies on much the same terms as it has done in the past? Will it deal with such societies direct or will the Central Banks be used as a collecting bank? The latter should undoubtedly be the case for there must be no question of competition between them and the Provincial Bank.

The success of co-operation in India will be increasingly judged in future years by the progress made by agricultural non-credit societies and by non-agricultural societies. Bombay at present need fear no invidious comparisons with other Provinces as far as such societies are concerned. It has numerous societies of both kinds and is constantly branching out into new lines of work. The supply of pure milk to large cities is a question well worth the attention of the Co-operative Department especially in view of its close relation to infant mortality. It is very disappointing to find that while the department is doing its duty in this respect, municipalities, with the honourable exception of Bhusaval,

have entirely failed to do theirs and have rendered no assistance to the co-operative dairy societies which have been formed. It is very evident that much educative work in matters of public health is still necessary and that local bodies have still to master the rudiments of what should be the most important part of their functions. Their apathy hushed the result of forcing the Co-operative Department to take a different line. The attempt to improve city milk supplies from within will not be pressed but efforts will be made to increase the supply by bringing the milk from outside and by organizing its distribution. It is hoped that competition will have the effect in the city milkmen which persuasion has failed to achieve.

Of other agricultural non-credit societies, mention must be made of the fourteen manure purchase societies, which bought locally seven million pounds of cake, of the six cotton sale societies, which sold over five million pounds of cotton and of the three jaggery societies, which sold over eight million pounds of jaggery. The object of all these societies, whether sale or purchase societies, is the abolition of unnecessary middleman and, in the case of the cotton and jaggery societies, the circumvention of the tricks of the local merchants in regard to such matters as weighment. It will be obvious that they deserve encouragement from the big buyer in search of a pure article for he can place much more reliance on the produce sold by executive on that bought from the petty dealer who, certainly in the case of cotton, lumps a number of lots—good, bad and indifferent together. Societies, the aim of which is even more definitely to improve the character of the crops grown, are the seed societies, of which there are now twelve. Six of these have been formed in Khandesh specially for cotton on the lines of those which have proved so successful in Berar. The rapid development of such societies should do much to help in the solution of the

problem which confronted the Indian Cotton Committee in its recent enquiries, though we imagine that that Committee would have been better pleased if their activities were utilized to spread a cotton superior to *roseum*.

Bombay can boast of the largest and most prosperous non-agricultural societies in India. The G. I. P. Railway Society with a membership of nearly 9,000 and a working capital of over Rs. 11½ lakhs must be easily the biggest Co-operative Society in India. The B. B. and C. I. Railway has a similar society though on a smaller scale, its membership being 6,372 and its capital records Rs. 3½ lakhs. It may be argued that the keen interest in these societies taken by the railway authorities gives them an adventitious advantage but that this contention is not borne out by facts is shown by the progress made by other societies which are not so favourably situated. The Shamrao Vittal Society has a working capital almost as large as that of the B. B. and C. I. Society. The working capital of the Ahmednagar Central Bank is over Rs. 3¼ lakhs and there are several other Peoples' Banks with a working capital of over a lakh. A bank with a capital of this amount may be a small institution from the point of view of the big Joint-stock Bank but, from any other point of view, is by no means an insignificant institution.

There is a wide scope for co-operation amongst millhands, artisans and similar classes but what has been done so far is merely an index to possibilities. Co-operation presupposes equality but societies amongst the classes just mentioned cannot for the present succeed unless the instinctive and the drawing force come from outside. As Mr. Ewbank says, it is only where the head of the firm takes an interest in a society that its results are satisfactory. That interest does not unfortunately extend to the two chief centres of the mill industry in India, Bombay and Ahmedabad, for the societies so far formed amongst millhands

are at Gokak, Hubli and Broach and in East Khandesh. The sweeper societies at Nadial, Kaira and Satara show what can be done amongst the most unpromising classes but here again help and sympathy from outside are essential and will be for a very long time to come.

There are many other points of interest in the report, such as the excellent work which is being done to help the handloom weavers, but considerations of space forbid us to deal with them at length. Before taking leave of the Report, a word must be said about Sind. Progress in that part of the Bombay Presidency has not hitherto been so rapid as elsewhere, for co-operation has so far been merely a subordinate part of the work of the superintendent of Land Records. This defect has now been remedied and, in future, Sind will have a whole time Assistant Registrar working under the control of the Registrar. We doubt, however, whether much can be done in Sind unless there is some change in the system under which land is cultivated. The cultivation at present is probably the worst in India. The cultivator is merely a yearly tenant and his interest in the land is limited by this fact. Until that interest becomes more permanent, it is difficult to see how his status can be improved by co-operation. This problem is nowhere referred to in the report which dwells with some what unwarranted satisfaction on an increase in the number of societies in Sind from 27 to 54. It will be interesting and instructive to see how it is tackled by Mr. Ewbank.

The trade returns from British India for June show that the imports have increased by £2,918,000, and the exports by £421,000, compared with the corresponding month last year.

THE VALUE OF DEEP CULTIVATION IN AGRICULTURE.

BY R. PALIT.

OUR countrymen while alive to the agricultural improvements of the country often overlook those common facts in agriculture that go to constitute its very essence. If we enquire into the fundamental principles on which the great success of modern agriculture is based, we find them three in number:—(1) Deep cultivation, (2) Judicious and ample manuring, and (3) Selection of seed. We are certainly within the mark when we say, that the general adoption of these principles in England, under the fostering care of great and wise landlords, has nearly trebled its agricultural production. Germany owes its success in agriculture to the great Leibig and it is to the wealth and forethought of England's great landlords, that Englishmen owe the successful introduction into practical agriculture of those scientific principles, which at one time the whole of Europe considered to be senseless effusions of a diseased brain. When Leibig's great genius comprehended the true principles on which vegetable growth depended, principles which were destined to open a new era for agriculture, when he proclaimed them to the world and deduced their bearings upon agriculture, the practical agriculturist rose in opposition, and apparently proved by facts that Leibig's theories were wrong. Perhaps our readers will remember what a violent discussion took place at the time between science and practice. But Leibig's genius rose equal to the occasion: rashly he had uttered his theories; patiently and slowly he set to work to prove them, and when twelve years after, he finished his task, and published the results in his "Natural Laws of Husbandry" his enemies were put to the

blush for their rashness of opposition, and his experiments were welcomed by every scientific man in Germany. For his experiments proved every one of the scientific principles he had laid down, with the exception of his supposition that, as plants absorb their mineral food in a state of solution in water, this food must exist in a soluble form in the soil. He found out afterwards that such was not the case, and that the mineral plant-food in arable soil, enters into peculiar combinations, which though *de ipsis* insoluble in water, become immediately soluble in that medium, when *Osmose* and *Exosmose* and the vital force of plant-life are brought to bear upon them. He crowned his work by discovering, what is now called the physical combination of available mineral plant-food in arable soils. He explained that the cultivating processes of husbandry, meant but the development of available mineral plant-food from their unavailable mineral plant-food from their unavailable chemical combinations, by the action of atmospheric influences; to be arrested, as soon as rendered soluble in water, by the physical attraction of the surrounding particles of arable soil. He explained what is the difference between the arable surface soil of agricultural fields, and their unarable subsoil and how to increase the quantity and to improve the quality of agricultural produce, by deep cultivation.

I think it was some forty years ago, that the columns of Agricultural papers in Europe, teemed with records of experiments regarding deep cultivation, the favourable results of which convinced even the most conservative farmer. Deep cultivation, we may say, therefore, is now an acknowledged fundamental principle of agriculture and it has more than doubled the agricultural capabilities of some districts in England.

But here it will be opportune to draw attention to the difference between deep cultivation and deep ploughing, which is

an essential one. Deep ploughing brings the under, or subsoil of fields to the surface, not always, be it remembered, an advisable procedure; while deep cultivation, or subsoiling, leaves the subsoil in its original position and only stirs and loosens it, rendering it permeable to atmospheric influences, and thus increases the depth of the surface soil without producing any evil consequences.

As a general rule, deeper ploughing should be done gradually, that is, the process of deepening should be the work of some time. There are soils that may be deepened at once and in one operation, without any bad result; but such soils are scarce. On fully 90 per cent of our cultivated land, it would be unwise to increase the depth of the soil suddenly by deeper ploughing, as the raw subsoil thus brought to the surface would lessen the productivity of the surface soil, until by exposure to the chemical action of atmospheric influences, it loses its pernicious properties, and becomes fitted for the support of plant-life. There are very few instances in which it is safe to bring up by deeper ploughing more than two inches of the subsoil during a year; indeed, if the soil was an ordinary one, and it became necessary that it should be ploughed six inches deeper than it had formerly been ploughed, we should prefer to arrive at the desired result in four years, instead of three; though we had a plentiful supply of lime and of other manures, we should be satisfied with a much less time to affect it. If deeper tillage is, therefore, to be attempted by means of the plough it will be wise to proceed gradually; but if by means of the subsoiler or cultivator, the desired depth may be obtained at once, as no harm can result therefrom, it is necessary that these distinctions should be remembered.

No soil can suffer deep tillage by the plough nay, for a time, produce injurious results, partly from physical, and partly

from chemical influences. The new soil brought to the surface may be soapy and retentive, and thus may render the land difficult to bring into a condition fit for the reception of the seed; or the raw soil may contain salts in chemical combinations, which are injurious to plant-life, and which under exposure to atmospheric agencies, must assume new combinations before healthy crops can be produced. These injurious agencies may be neutralized by exposure to atmospheric influences, but a long time is needed to effect this; however, by the liberal use of lime and of other manures much can be done to facilitate the changes needed to restore the soil to a healthy state.

Bearing in mind now, what deep cultivation has done for England and other countries, the shallow cultivation of Indian agriculture has been regarded as one of its greatest faults. Before the introduction of deep cultivation into England, the usual depth to which soil was cultivated and was arable, was five inches; it is now more than double that. The average depth to which soil is cultivated in India is three-and-a-half inches; and when we come to enquire why this shallow cultivation, we are told that such has been the habit of the cultivator from time immemorial. Nothing could be said against the system, if plants confined their area of mineral food absorption to the depth of three-and-a-half inches, if their roots would descend only that depth and not further. But when we find that plants wherever possible, send their roots down into the subsoil, and when this is stirred or deeply cultivated, that they double and treble their root surface, and that the yield stands in direct proportion to the greater or less root surface, then, indeed we cannot estimate too highly the introduction of deep cultivation into India, nor advocate it too strongly. Leibig attaches the utmost importance to deep and efficient tillage, as an agricultural basis. He says

"The agriculturist has to do with the soil alone; it is only through it that he is able to exercise an immediate influence on plants. The attainment of all his objects in the most complete and profitable manner, presupposes the exact knowledge of the effective chemical conditions for the life of plants in the soil: it further presupposes perfect acquaintance with the food of plants and the source from which it is derived, as well as with the means for rendering the soil suitable for nutrition, combined with experience and skill in employing them in a proper way, and at the right time". Science has indicated, that in the subsoil we should seek for increased profits, for it teaches us that in the great majority of soils, the earth at every depth contains a certain portion of the elements of plant-food, which only require aeration and amelioration by disturbance, drainage, and manure, or learning to render them gradually available as plant-food.

But there is another phase which enters largely into the question, when considering the advantages of deep cultivation in India. It is the scarcity against drought, which crops on deeply cultivated soil enjoy, that makes the general introduction of this system into India so important a measure, worthy alike the most earnest considerations of the rulers and the ruled. In the year 1869, some experiments were made by Mr. Rivett Carnac on the subject of deep cultivation and the results were pronounced to have been satisfactory. Then again, Mr. Robertson, of Madras Government Farms, made some experiments in deep cultivation in the year 1875, and he said that the plants were "remarkably luxuriant that grew on the land". One Mr. Harman carried out some experiments in deep cultivation on the Bangalore Experimental Farm in 1877, and the result was equally striking. We are told by the same authority that a rice-crop sown on one of the plots of the Bangalore

Experimental Farm yielded rice at the rate of nearly 3,000 lbs. per acre. The crop grown dry without any irrigation yielded a result most astonishing during a season of prolonged drought, the secret of success being deep cultivation. In our country rice has always been considered a crop requiring such an excess of moisture, that to get a crop at all under the circumstances ought to convince the most sceptical of the advantages of deep versus shallow cultivation. Let us make a beginning by introducing deeper cultivation throughout the length and breadth of India.

Let a handsome prize be offered, large enough to attract English, and American manufacturers, for the best plough and the best subsoiler, adopted to the cattle and the habits of the cultivators of this country. And then let Government distribute a few thousands of these ploughs to the most advanced and enlightened Zemindars and other agriculturists, offer prizes for the best cultivated fields, and establish centres where these ploughs could be manufactured and supplied on demand. We even go so far as to say that these ploughs and subsoilers if the primary introduction is successful, should be supplied gratis to the ryots, not in thousands, but in hundreds of thousands, for, we consider that improved ploughs and deeper cultivation is the means by which we may succeed in supplanting a vicious system of spoliation of soil by a rational system of true husbandry.

In the House of Commons on July 1, Colonel Yate asked the Secretary of State for India what steps the Government of India proposed to take to inaugurate an early investigation into all possible sources of water-power in India, with a view to a thorough hydrographic survey of the whole of India with regard to electric power.

An agreement has been made between the Secretary of State for India and the Tata Steel Company, by which the latter acquires additional land for extensions, and undertakes to expend £2,000,000 within ten years.

THE IMPORTANCE OF FOREST RESEARCH WORK.

BY M. VENKATANARASAPPA, B.A.

The total area of forests in the Mysore State may be taken as roughly 8,850 square miles, which is nearly 30 per cent of the total area of the State. But the actual forest operations extend only to about 3,600 square miles which comprise the reserved tracts, the rest consisting of unclassed forests which have not been brought under any definite system of forest conservation and of which it is uncertain what proportion will eventually be retained as forest and how much will be made over to meet the purely agricultural needs of the country. As Government have recently ordered the reservation of 546 sq. miles in the Shimoga District only on the recommendations of the Forest Committee, it may be safely assumed that another 1,000 or 1,500 sq. miles of State forests will be added in the near future, thus increasing the total State forest area to 4,600 or 5,000 sq. miles.

In the management of this great property rich in its vast resources, we have many problems to face, Scientific, Commercial, Economic and Administrative. Of these the Scientific branch of the profession is second to none in its importance and must proceed hand in hand with commercial exploitation in order to enable the State to work its property to the best advantage. In other words too much stress cannot be laid on the importance of scientific and research work and on its influence on the management by Forest officers of the valuable estates committed to their charge and on the development of these estates on correct scientific and practical lines.

For the first fifty years since its inception the history of forest administration in India is a history of a scientific

department, at all times undermanned, concentrating all its energies on the work of organization and administration on commercial lines with little or no attempt to co-ordinate or elaborate the scientific knowledge so necessary to its successful economic working. The dawn of scientific forestry in India dates from 1856 with the advent of Dr. Brandis to organize and administer the teak forests of Pegu. Since then numerous problems in forestry have been worked out: but it may safely be asserted that prior to the establishment of the Research Institute at Dehra Dun in 1906 practically all the important scientific work done by Forest officers was the outcome of individual efforts on the part of enthusiasts in the particular branch of work concerned, and not the result of any organized attempt. Even these keen enthusiasts have hardly been able to achieve any substantial results save under exceptionally favourable circumstances such as the tenure of special posts or the leisure afforded during leave or retirement. The consequence is that although the Forest officers have not been backward in devoting themselves individually to the solution of scientific or economic problems, yet a vast amount of useful original work has been irretrievably lost owing partly to the absence of an organized system of carrying out investigations and recording results, which is essential for economizing time and labour spent on research work, and partly to the great differences in the manner of carrying out investigations and experiments, in consequence of which no definite conclusions could be arrived at.

These advantages have mostly disappeared with the formation of the Research Institute at Dehra Dun which showed clearly the great interest which the Government of India took in Scientific Forestry and the importance they attached to it.

In Mysore, the Department cannot so far boast of having achieved much in the

way of original investigation due partly to the always undermanned staff being hardly adequate to cope with the routine measures of protection and exploitation of the forests and partly to the want of the requisite proportion of trained officers till recent years. The first advantage has been only very slightly remedied by the re-organization of 1911, and the impending re-organization of the Department, inasmuch as the percentage of establishment charges to the total revenue is still much lower in Mysore than in provinces of British India. The second advantage has in a large measure been removed in recent years, and the Department can now boast of a fairly good proportion of officers trained in Europe and at the Provincial Service Class at Dehra Dun. The fact that two officers were placed on special duty in the beginning of 1914 for the exploration of the forest resources of the State and for the compilation of a commercial guide to the forest economic products, both of which have since been completed enabling practical action being taken thereon; that a special officer with large experience in British India has recently been appointed for forest industries; that a Forest officer has been deputed to Japan and America to study the industrial aspects of forestry; that two officers are employed on the compilation of Regular Working Plans for the systematic and scientific working of the forests; that the services of experts have from time to time been employed by Government for the special investigation of the prospects of establishing paper-pulp, match and pencil factories and iron smelting industry in the State; that the advantages of distilling sandal-wood oil have been investigated and oil factories established at Bangalore and Mysore shew the keen interest evinced by the Government of His Highness the Maharaja of Mysore in the scientific aspect of forestry. There is no doubt that, under the able guidance of Mr. M. G. Rama

Rao who evinces a keen practical interest in the economic and industrial branches of forestry, the Department will make rapid strides in this direction.

The Main Duties of a Research officer are :—

- (1) To post himself up-to-date with the progress of work and thought in his particular branch in different parts of the world, more especially in India. This implies access to all the latest literature in the shape of books, periodicals and other publications pertaining to his special subject and preferably also some knowledge of French and German which languages practically monopolise the most up-to-date works on all scientific subjects.
- (2) To collect and collate systematically in "Ledger files" or otherwise, all information pertaining to the subjects under investigation so as to be readily available for reference and guidance.
- (3) To gather complete collections of samples and specimens pertaining to his subject, Such as, a herbarium, collection of timbers and of forest economic products, a Zoological collection, a Sylvicultural collection, etc.
- (4) To carry out original investigation in his particular subject under a definite programme, with a view to bring his investigations to a definite conclusion. According to the subject and point of investigation this may consist of mere local enquiries or may involve experimental laboratory or other work of a more or less detailed nature extending, it may be, over a few days only

as in the case of chemical analyses, test of mechanical properties of timbers, etc., or over several months or even years as in the case of sylvicultural and botanical investigations. Experimental work should, where necessary, be supplemented by observations and trials in the forest under natural environments.

- (5) To give advice and assistance in his branch of work to Forest officers and other bona fide enquirers seeking it.
- (6) To publish from time to time the results of his investigations with a view to avoid duplication and overlapping of work and to prevent others wasting their time and energy in traversing the same ground.

More often than not, research work especially in Forestry, does not bear the test of direct money returns or even of direct savings which might be expected to follow in the wake of improved methods of working. In estimating its utility we must look rather to its effect on the development of the forest resources of the country, economic methods of exploitation, improvements in sylvicultural systems and methods of regeneration and to the impetus it is bound to give to the introduction of more rational systems of working our forests than in vogue heretofore, besides opening out an important field for commercial enterprise while at the same time providing a market for large quantities of produce which at present goes to waste. Officers undertaking research work will not be able to do justice to their work or even to devote sustained attention to the subjects under investigation if hampered with much of routine work which has often a deadening effect on the enthusiastic spirit of enquiry so essential to the nature of the work.

There are many problems in every branch of Forestry yet to be solved and on their solution depends to a great extent the future welfare of our forests and the substantial increase of revenue which may confidently be expected from them. Some of the items of investigation which may with advantage be undertaken are:—

- (1) Enquiry into the best sylvicultural method of treating the teak forests so as to combine the benefits of fire protection with the satisfactory regeneration of the forests. It is a recognised fact that under the selection *cum* improvement methods of treating our teak forests the inevitable results of fire protection and of removing only a few valuable species is the reduction of the proportion of teak and other valuable light demanding species and the thriving of the less valuable shade bearing and hardier species. An enquiry into the suitability of the uniform method of successive regeneration fellings or the group method to the teak forests—seems called for.
- (2) Determination of the height, diameter, and volume growth of individual trees at various ages, and the preparation of 'yield-tables' for the various important species occurring in our forests.
- (3) The effect of fire conservancy on the relative thriving of the natural regeneration of the several species and on the growth of bamboos and other grasses.
- (4) Improvement in the methods of propagating, and the manufacture of lac.
- (5) Preparation of tannin extracts from the bark and fruit of the

tannin yielding trees occurring in our forests.

- (6) Distillation of essential oils from the leaves, flowers, fruits, grass, etc., of species occurring in our forests.
- (7) The antiseptic treatment of timbers, especially the inferior ones for which there is no demand at present with a view to render them fit for use as railway sleepers, posts, building construction, etc. The non-exploitation of the inferior species in our forests at present is proving detrimental to the principal species whose proportion is bound to decrease with the removal of only a few well known kinds of trees occurring amongst a host of soft wooded and inferior species hampering the growth and regeneration of the principal kinds.
- (8) Manufacture of wood and bamboo-pulp for paper and the trial of the suitability of the local grasses for such pulp.
- (9) Regulation of grazing so as best to admit of the conservation of the forests consistently with providing for the legitimate requirements of the agricultural population.
- (10) Preparation of a rational scheme of exploiting sandal-wood with due safe-guards for ensuring a sustained supply for the future.
- (11) Solution of the spike disease of sandal-wood.
- (12) Collection of statistics for the different kinds of local timbers regarding the available annual supply, the quantity now being extracted from the forests every year and the proportion of it

used for the several industries such as house-building, furniture, cabinet work, agricultural implements, etc. Such statistics have been collected for all the important species in advanced countries like America.

- (13) Preparation of tables showing the uses to which the several kinds of timbers are suited, with a view to create a market for the kinds not well known at present.

Many of the above subjects of investigation must from their very nature take years to carry to a successful issue and to form reliable conclusions; but without a steady pursuit and sustained attention, such results cannot be achieved by desultory and spasmodic efforts at research.

As regards the measures to be adopted, the following few suggestions are offered by way of inviting a further discussion of the subject with a view to come to a definite understanding regarding the lines on which research work is to be conducted in our State:—

I may say at the outset that the establishment of an elaborate and fully equipped research institute with a full complement of competent specialists for the several branches of forestry, is in my opinion, out of the question in a small State like Mysore on account of the enormous capital and recurring expenditure involved by such a fully equipped and manned institute. It will meet our present requirements if a combined Research Institute and Information Bureau on a small scale is started at Bangalore, with two main branches, *viz.*, (1) Industrial and Applied Chemistry and (2) Forestry, each fully equipped with the requisite laboratories and appliances for carrying on experiments on the several subjects bearing on Forestry and Forest Industries. The second branch may be in charge of a special Forest officer with

European qualifications and with a sound knowledge of Botany and Forestry as well as German and French languages, while the first will be in charge of a specialist in Applied and Industrial Chemistry. For administrative purposes the Conservator of Forests may be in charge of the Forest Research Institute and the two specialists will work under his general supervision and guidance. A Forest Economic Museum containing samples of the various forest products of the State may also be attached to the institute, which will also serve as an information bureau.

The two special officers of the Research Institute and about ten or fifteen selected officers of the Department who shall ordinarily be the District Forest officers and the special officers attached to the Department will meet once a year with the Conservator of Forests as President, draw up an annual or preferably a triennial or quinquennial programme of the subjects and lines of investigation to be followed during the ensuing period. On the basis of the said programme the District Forest officers and their subordinate trained staff will work up in groups the several subjects allotted to them. Each trained officer of and above the status of a Ranger may be furnished with a set of the most essential apparatus for determining the girth, height and volume growth of the chief species occurring in his range in selected sample plots, as well as with the requisite botanical and entomological apparatus consisting of a small microscope, a lense, dissection implements, preservatives, herbarium presses, collection boxes, mounting papers, etc., and be required to work on the lines and subjects of investigation, laid down by the Central Committee as well as on the other matters of local importance and to tabulate and report the results of his experiments to the District Forest officer, who can place the results of the investigations made by all his subordinates before the Central Committee at its next

annual meeting, for discussion and publication in the form of periodical bulletins for future guidance. Samples for laboratory tests may be sent to the Research Institute whenever necessary. There is no doubt that under proper guidance and organization many of our Range officers are capable of turning out a lot of useful investigation and experimental work; and such work while adding zest and interest to the routine work of a Forest officer would at the same time place first hand information from numerous sources at the disposal of the Central Committee for their deliberation and elaboration. Honararia may, on the recommendations of the Research Institute, be given periodically to such of the officers as evince special zeal and interest in original investigation work and render meritorious service in such work, so as to serve as an incentive to others who are prone to take less interest. The special research officers may from time to time tour out and supervise and regulate the experimental and investigation work which is being done by the several officers.

The Applied Chemistry branch of the institute could work out questions such as:—

- (1) The distillation of essential oils and spirits from grasses, leaves, etc., of species found on a sufficiently large scale in our forests.
- (2) Preparation of tannin extracts.
- (3) Antiseptic treatment of timbers and its effect on their durability and immunity from the attack of white ants.
- (4) The percentage of oil yield from the several oil seeds and fruits obtained from the forests.
- (5) Classification and study of medicinal herbs, roots, bulbs, etc., found in forests, and supply of information to pharmaceutical chemists and other firms.
- (6) Dye-stuffs, and methods of extracting and utilizing them.
- (7) Manufacture of wood-oil and its bye-products, wood and bamboo-pulp.
- (8) Methods of refining and clarifying essential oils, resins, gums, wood-oils, lac, etc.

The forestry branch could tackle and work out questions such as:—

- (1) Investigation into the most suitable methods of sylvicultural treatment for the different types of forests.
- (2) Methods of regeneration and the best way of supplementing natural regeneration by artificial propagation, so as to ensure the regeneration of exploited areas.
- (3) Suitability of working plans drawn up for the several forests.
- (4) Determination of the height, diameter and volume growth of trees of the more valuable species at various ages and preparation of yield and volume tables for the important species occurring in our forests.
- (5) Effect of fire-protection on the several types of forest.
- (6) Best method of propagating lac and the suitable host plants.
- (7) Study of the possibilities of various forest industries, with special reference to local conditions.
- (8) Collection of statistics for each species regarding the available annual supply, quantity annually extracted, and the proportion of it, which is utilized for the several industries.
- (9) Preparation of lists showing the suitability of the several kinds of timbers for the several possible industries.
- (10) Study of the spike-disease of sandal-wood
- (11) Preparation of a forest flora for Mysore.
- (12) Preparation of stock maps for the several important forests showing the density and composition of the crop and other useful information.

It is needless to give, in a general note on the importance of forest research work, details of the capital and recurring expenditure and particulars of laboratory and other equipments necessary. But it may roughly be assumed that an initial grant of about two lakhs of rupees for buildings, laboratories, library, stores, etc., and a recurring expenditure of Rs. 75,000 or Rs. 1,00,000, will meet the requirements of a Research Institute of the nature outlined above and will be money well spent.

ECONOMICAL SUBSTITUTES FOR COAL AND OIL FUEL.

BY T. SINGTON.

THE industrial conditions of the present time and the possibly still more arduous conditions of the future, when we shall have to face competition from all directions, make economy of production a most important condition, which all manufacturers in every industry, engineering probably more than any others, will perforce have to study. Coal economy is one of the items in which a saving may be affected both in power production and metal smelting. There is at present in many mines a great waste of coal dust; in the getting of many varieties of coal the production of coal dust is unavoidable and to a very considerable extent it is a waste product. Briquetting of coal dust has now been introduced in many localities and a ready market is found for briquettes; but probably only a small percentage of the coal dust accumulating is used for that purpose. Closely allied with the use of coal dust is of powdered coal produced by mechanical means. Some notes on the application and advantages of both may be useful for present use and future reference. It is perhaps not thoroughly realised by many large users of coal, that coal dust properly applied is a fuel of high calorific value. It is reported that in the United States several works have substituted powdered coal for oil and have effected a considerable saving by the change. To obtain good results "Coal Carburetters" are necessary, which introduce the powdered coal into the furnaces, suitably mixed with the proper proportion of air, an obviously all important point. Immediate ignition is followed by a rapid and complete combustion of every particle of fuel. Fuel requirements are provided for by value regulation, so that the length of the flame can be adjusted to suit the prevailing conditions and

requirements. By means of sensitive and positive control the fuel mixture can be turned on and off precisely as in the use of oil and gas, reducing cost, preventing waste and permitting the maximum absorption of useful work from all the heat units used.

Comparing the use of powdered coal and coal dust with that of ordinary coal, labour is saved; the quantity of ash formed by use of the former is reduced to near vanishing point by the complete combustion of the fuel. Any ash left is practically devoid of carbonaceous matter, while coal ashes contain a considerable percentage of such matter. The saving is greater than the cost of pulverising the coal. A screw conveyor facilitates the feeding of the powdered coal from the storage bin to an injector, by which it is carried forward to the furnace by a jet of primary air, at a pressure of about $\frac{1}{2}$ lb. per square inch; pre-heated secondary air slightly above atmospheric pressure may also be provided closer to the furnace. It is all important that the storage bin in which the powdered coal is kept should be kept perfectly dry, as damp would obviously seriously affect the smooth working of the system.

Powdered coal has been successfully employed for locomotives, the coal being mixed with steam and injected by special apparatus into the firebox. It is asserted that the substitution of powdered for lump coal and handfiring results in a saving of from 15 to 25 per cent. Powdered coal used with pre-heated air is said to possess many advantages for reverberatory furnaces. For use in this class of furnace the coal dust must be dry enough to be readily suspended in the air blast, but not so dry as to render spontaneous combustion likely. The limit of moisture should be 0.75 per cent to give good results. The degree of fineness should be such that 90 per cent will pass a 100-mesh sieve and 80 per cent a 200-mesh sieve whilst the most effective blast pressure should be from half to one pound per square inch.

MAGNESITE IN SALEM.

BY A. P. SMITH.

IT was with very keen interest that I visited the magnesite quarries in Salem, photographs of which were on view at the last Madras Exhibition. The quarries are usually referred to as the "magnesite mines," but I saw no mine properly speaking. Cuttings into the hills at various levels, the wall like surfaces showing the veins of magnesite and serpentine crossing and inter-crossing the earth in which the magnesite is imbedded is what I noted. "The veins," according to Mr. H. H. Dains, F. I. C. M. Inst. M. and M., and Vice-President of the Institution of Chemical Technologists "intersect an ultra basic intrusion of eruptive rock called dunite.....This rock, which is ultra basic on account of the absence of felspar and quartz, has undergone a series of remarkable mineral changes owing to the non-resistance of the unstable olivine to metamorphic influences." Mr. C. S. Middlemiss, in his Report on the magnesite areas in Salem (Geological Survey of India) makes mention of the change resulting in the formation of magnesite as follows: "First, Dunite"—which I may mention is named after its prototype native at the Dun Mountain, New Zealand—"which gradually develops into Olivine and Chromite. The Olivine changes into a number of varieties of Serpentine, e. g., massive, Retinalite and Pierolite, which again changes into Magnesite, Chalcedony, Silica, etc." An analysis of Dunite (Sp. gr. 3.176) gives Silica 39.10, Magnesia 48.26, Iron, Alumina, Manganese, Chromium, moisture, etc., 12.64. Oriental olivine (Sp. gr. yields, Silica 39.73; Magnesia 50.13; and ferrous oxide 9.19. Indian magnesite analysed yields various results according to the specimens analysed. For instance, Dains obtained the following percentage: Silica 0.29;

Iron oxide and alumina 0'65; manganese oxide 0'20; lime 0'83, magnesium oxide 46'42, carbon oxide 50'71, combined water 0'16, magnesium carbonate—total 99'26. The magnesium carbonate found is 97'13. Four other analyses render slightly different results. Magnesite is worked in Euobea in Greece, in Syria, California, Canada, South Africa and Macedonia. The Indian variety is claimed to be superior even to the Greek magnesite.

Magnesite, according to the *Encyclopædia Britannica*, is a mineral consisting of magnesium carbonate ($Mg. Co_3$) belonging to the calcite group of Rhombo-hedral carbonates. The compact material has the appearance of unglazed porcelain, and the earthy that of chalk. The hardness of the crystallised mineral is 4, and the specific gravity 3'1. The name magnesite, as originally applied by J. C. Dela Metheric in 1797, included several minerals containing magnesium, and, at the present day, is used by French writers for Meerchaum. The mineral is also called bandisserite, from Bandisser near Ivrea in Piedmont. Bernerite is a ferruginous variety.

At Salem the area in which magnesite is found is widely dispersed as indications of the existence are seen in the rocks covering the low hills between Suramangalam and Salem. The mineral covers a superficial area of, says Mr. Dains, 2,000 acres of unknown depth which exceeds 60 feet. From the *Salem Gazetteer*, I think, the area given by Mr. Dains is too small as instead of about $3\frac{1}{2}$ sq. miles the area is about 10 sq. miles. In Salem these "chalk hills" are called by Indians *chunambee karudue*, and the inevitable leghed accounts for the white outcrop as being the survival of the bones of the Sovereign Bird Jatayu which tried to do battle with Ravana when that ferocious and implacable demon carried away Sita, when Sri Rama was absent from her side. Jatayu was killed by Ravana and the

white outcrops of rock are declared to be the bird's white bones.

I noticed that the serpentine veins were not straight but were often formed in a sinuous form—perhaps this accounts for the name serpentine. The serpentine is blue and when dug out bears a strong resemblance to dry chips of blue wood. The illusion is dispelled immediately the observer takes a bit of serpentine in his hand and finds it extraordinarily heavy.

The Magnesite Syndicate operating at Salem is in the direct charge of Mr. Conniell who was assisted till very lately by Mr. Bruce Gordon as his works manager. The contract system of labour prevails and the mineral is placed in orderly stacks according to the size of the lumps quarried. These stacks dazzle the eyes on a bright day as they are perfectly white. Enormous quantities of the mineral have been exported and though just now there is a falling off in the export owing to special war conditions there is a great future before the industry. According to Thurston the average annual production during the last few years amounted to over 2,200 tons of unusual purity. The first idea of treating magnesite industrially originated with Dr. McLeod in 1826. He suggested that the mineral could be utilized as a substitute for imported cement, but no attempt was made to work it. An attempt was made some years later by Mr. Heath to work the chromite found associated with magnesite, but without any apparent success. In passing, it may be mentioned that in 1906-7, 11,000 tons of chromite deposits were raised in Mysore where it is associated with olivine and serpentine.

THE USES OF MAGNESITE.

In a raw state it is chiefly used for the manufacture of carbon dioxide, the gas being obtained in the United States of America by calcination in retorts. What remains is used to make refractory bricks for basic furnaces. In some works the carbon dioxide is evolved by the action of

sulphuric acid. Mr. Dains says that calcined magnesite is classed according to the temperature at which the calcination takes place as lightly calcined, or caustic magnesia; and dead, burnt, sintered or shrunk magnesia. The caustic magnesia is calcined at a temperature of 800°C . and is largely used in Sorel or Oxychloride cements, fireproof partitions, plaster, artificial stone, steam packing, flooring, grind-stones, millstones, emery and polishing wheels. Chromite again is the natural source of chrome compounds and the largest portion of the mineral raised is devoted—Salem is not referred to—to the manufacture of salts of chromium used in tanning operations as dyes and pigments. A smaller portion is used for the manufacture of refractory chrome bricks, for lining furnaces and chrome steel used for armour plating, on account of its great toughness.

The magnesite at Salem is calcined in a gas fired kiln to erect and set working which a German Engineer and some German workmen were specially imported. The process of calcination by gas is most interesting and by an ingenious arrangement the calcining, the grinding of the calcined magnesite, etc., is admirably done. The standard quality—stipulated for by continental buyers at the Leipsic meeting in 1908 is 85—90 per cent magnesia with lime not exceeding 4 per cent—conditions which the Indian magnesite easily fulfil.

Dead, burnt or shrunk magnesia is calcined at a temperature of $1,700^{\circ}\text{C}$. and is at its best when the calcination is done in a gas fired kiln as contamination from the ash in a fuel kiln is prevented. The principal uses of dead-burnt magnesia are as a refractory lining for open hearth furnaces and converters in the steel industry, for rotary kiln linings in portland cement manufacture, for furnace hearths, crucibles, cupels and refractory bricks. "The most refractory dead-burnt magnesia is obtained from magnesite containing little or no silica, lime, oxide of iron or alumina, and the Indian

magnesite is exceptionally free of these deleterious compounds." Crude magnesite is largely utilised in the preparation of aerated waters for the production of carbonic acid gas (CO_2). The residue is disposed of to artificial brick and stone manufacturers. A stone resembling marble has been produced of a fine quality.

Epsom salts of the finest quality is a product which is now in the market. The well-known Sorel cement is another product and is called after Stanislaus T. Sorel, a Civil Engineer in Paris, who, in 1853, discovered that a mixture of zinc chloride and zinc oxide formed an extremely hard cement. The cement is adopted for indoor purposes as it deteriorates if exposed to damp and atmospheric influences. Artificial buttons, ornaments and moulded objects of various description are made from broken glass minerals, etc., mixed with magnesia cement and artificial ivory is obtained by associating pure loose carded cotton with magnesia cement which may be kneaded to the required shape, or after hardening turned or chiselled like ivory. In the works of Salem, the bungalow is paved with bricks made from magnesite and the walls plastered with a magnesite preparation. The plaster takes a fine polish similar to the polished chunam seen in old Indian buildings which are free from whitewash. Magnesia is used in water purifiers. It is said to decompose the calcium and magnesium carbonates and calcium sulphate, yielding precipitates which settle readily and so cleaning the water. The magnesia does not attack metals, protects the boiler from rust and removes all scale so that it is possible to provide a tank with a purifier for a considerable time without ill effects. Magnesite is now used in the manufacture of magnesia preparations, as an absorbent in the production of dynamite, as an adulterant in paint, porous cells for electric batteries, writing slabs, washable drawing and writing paper and as a substitute for lime for agricultural purposes.

OTHER METALS IN SALEM.

After the war, the magnesite in Salem and the chromite in Mysore are likely to become famous for their excellence and abundance. In this question of unusual possibilities, the district of Salem is rich in deposits. There is a great quantity of corundum in Salem appearing in a variety of forms, *e. g.*, lumps of grey, flesh coloured or purple brown hexagonal prisms, often as large crystals, in a matrix of finely granular felspar. Iron, gold, saltpetre, mica, rubies, manganese and crystal limestone have been found. Magnetic iron ore is abundant and only the scarcity of fuel and a lamentable disregard of the natural resources of this country are responsible for the neglect to exploit these minerals. It may be remembered that the Portonovo Iron Company had to close down in 1867, because of the lack of fuel and enterprise to obtain it. Labour being cheap, the magnesite is obtained by coolies slowly and laboriously, but if machinery were used real mining would be possible. The Salem mines are connected with the railway and transport to the coast is easy.

A statistical table which has just been issued showing the main features of the work of the Indian railways during each of the five years ending March 31 last throws an interesting light on the strain of the war on the Indian railways. The ordinary goods traffic rose during the quinquennium from 82½ million tons to more than 83 million tons, while other traffic rose from over 166,000 tons to 1,646,000 tons. The ton mileage of coal used rose from 4,147 millions in 1913-14 to 7,961 millions last year. Finally, the gross earnings of all railways advanced from 6,358 lakhs of rupees in the last year of peace to about 7,702 lakhs in 1917-18.

SERICULTURE AS A FACTORY INDUSTRY.

BY K. SUBBA RAO, B.A.

According to the latest publication of the commercial section of the Industries Department the value of raw silk exported from the State during the year 1916-17 was 30'70 lakhs and the value of the total output of silk 57'75 lakhs. The price of raw silk had risen during the last quarter of the last official year to nearly Rs. 723, per maund, the highest figure recorded. In this connection it must be remembered that in addition to the export of silk by Railway and Post Office, (1) the value of local silk utilised within the State itself in the chief centres of manufacture of pure silk and mixed (silk and cotton) goods like Bangalore, Mysore, Molakalmuru, etc., (2) the value of silk which might have been exported out of the State by agents who periodically visit the chief silk centres and take it along with them, and (3) the value of local silk taken to Kollegal by road by the silk growing tracts in the Mysore District where road traffic predominates and which are all exported from Kollegal as Kollegal silk have to be added.

An industry which gives to the ryots and merchants from the produce of about only one-fourth of the total number of taluks in the State or from an estimated extent of about 35,000 acres, in a year so much money as a little more than half a crore of rupees certainly deserves to be classed as a very important one. It should be remembered that Mysore occupies a unique position of vantage as it is the only tract in South India capable of producing silk on such a scale.

At present almost the entire out-put of local silk may well be termed the result of cottage industry. The 35,000 acres of mulberry and the ryots and reelers engaged in the industry are spread over a number of

villages. The methods followed are the customary traditional ones, more or less wholly devoid of the powerful impetus which organized concerted action and the use of modern scientific appliances and commodious and well-designed buildings could import to such an established industry.

The possibilities for the development of in Mysore are simply immense. The sericulture climatic conditions, the traditional skill of the rearers of worms and the reelers of cocoons are invaluable assets, the absence of which have made sericulture impossible anywhere else in South India or even in the other taluks of the State. By developing the industry on an organized, improved basis in the existing silk producing tracts and by introducing it judiciously and with a firm resolve in other tracts suitable for it, irrespective of immediate results and with a fair margin of time for the industry to be made self-supporting, the annual out-put may be largely increased if not almost doubled. Necessarily the work is of a permanent nature and will take many years for valuable results to be achieved. But once the industry is improved and spread over all the suitable parts of the State, is ensured of a sympathetic administrative and scientific guidance continuously, it will be as mighty and as permanent a factor in the economic prosperity of the people as improved agriculture or the successful working of large industrial concerns.

Since the establishment of the Economic Conference in 1911-12, the Agricultural Committee and the Mysore Government have adopted various measures for resuscitating the industry and developing it, which are all detailed in the reports of the Committee and other State publications. These measures have met with varying degrees of success owing to causes over many of which Government have no control. But the scope for further State action is as wide as the possibilities of development

are immense. While fully recognising the merit of efforts already made by Government, it may be pardonable to hold that they are yet far from adequate.

The industry is a century old. It is a well established one. But when did the Government realise its significance and concert measures to help it? Only a few years ago. Sericulture is as important as agriculture or the reservation of forests, the repair of roads, etc. But while the departments dealing with the above were established long ago, the Sericultural Department is of very recent origin and even now its organization when compared with that of the other departments lacks many essential requisites. Lost time has therefore to be made up. Government have spent in the past very liberally for a number of years in the case of other departments in their initial stages and the same measure of continued attention and liberality will have to be shown to the Sericultural Department for two or three decades. The first step is to declare the permanence of the Department and to place it on as firm and unalterable a footing as the other Departments of the State and to provide it with all the necessary facilities for undisturbed and continuous work.

It is not intended to draw up here a detailed programme for the orderly development and expansion of sericulture, for Government have probably all the necessary information or can easily get it. I wish only to invite attention to the need of the State stepping in to demonstrate how sericulture can be developed profitably as a factory industry. No private organization is likely to undertake the work in the immediate future and the State alone can command all the resources, facilities and the administrative and scientific supervision needed to give the experiment a fair chance of success. One-hundred acres of mulberry in a selected spot on the Krishnaraja Sagara Works, with

suitable rearing looms and buildings for reeling silk according to improved indigenous methods as well as according to the Japanese and Italian methods, with the necessary appliances, will tend a great deal to popularise the industry. It will be an epoch in sericultural progress. It will afford excellent opportunities for research work, for practical work, for comparative study, and for valuable inferences being drawn. It will contain the potentialities and necessary conditions of financial success. It will be the nucleus of a Sericultural Institute, both in its theoretical and practical aspect, with old world as well as modern methods and appliances side by side wherein may be trained the future Sericultural Diploma Holders of the Mysore University. If Japan confers honors and degrees on sericultural students why not Mysore? The sericultural graduate of Mysore is sure to find profitable employment both in and out of Mysore more easily than the Arts or Commercial graduate, because the Mysore University will for a long time be the only one which can undertake the work. Sericulture on a factory basis, cultivation of mulberry, rearing of worms and reeling of silk, being concentrated on a large scale in one spot specially selected for the experiment will be the best object lesson to the thousands of ryots engaged in the industry and contribute to make it highly popular in all parts of the State. I shall, if necessary, elaborate the details of the scheme in a subsequent issue.

It would appear, in Japan, the silk industry has all along derived its main support from the royal family. In Mysore also in parts of Chennapatna one variety of the mulberry plant is still called by a grateful people the *Sultani Kaddi* in memory of Tippu Sultan who introduced it in the villages. The present royal family and the Government are keenly alive to the importance of the industry and the factory in Mysore, if one is established, may well be named after the royal family and the *Ganda Berunda* flag flying over it will proclaim to the ryots all round that in Mysore also the mulberry leaf and the silk worm are under the special patronage of the highest and the most beneficent authorities in the State.

JAPANESE LACQUER.

BY CYRIL G. E. BUNT.

In certain spheres of commercial effort Japan is flooding the markets of the world. In fact, so keenly is she bidding for the world's custom *vice* Germany's exterminated trade,—so enormous is her output with this obvious object,—that we are in danger of forgetting that she is possessed of a worthy national heritage in the realms of art.

India seems to know but little of Japan's products other than those innumerable modern articles, cheap and strictly economic, that are now being thrown upon its markets. With the rest of the world it is beginning to fear that the legend "Made in Japan" may become as hackneyed and insistent as the erstwhile "Made in Germany."

But Japan, whatever her present direction of effort, has a far sounder basis for her present day activities than Germany ever had. Moreover, so long as she retains a grip upon that Asiatic tradition which is hers by inheritance,—so long as she is true to her own ideals,—and does not in her art, as in her commerce, strive to ape the West, she is inimitable.

Of all her arts there is probably not one that is more thoroughly her very own than that unique and highly artistic craft,—Lacquer work.

No one knowing anything at all of the finer work of the Japanese Lacquer-worker can doubt this for one moment. It is instinct with the very soul of *Dai Nippon*. It is the one art that secured the interest of the great West long before any movement, any cult of Things Japanese took hold upon the world. The word "Japanning,"—as now used of course a misapplication to a very inferior type of work,—shows how fully the beautiful Lacquer-work of Japan was identified with nationality.

Indian Lacquer is a very different thing and far removed from it aesthetically and artistically. Between the two there are no similarities nor can there be by any comparison.

It has been my privilege to handle and observe minutely some hundreds of the most exquisite examples. And now, as I write, thousands of miles removed from such delightful opportunities, the recollection of their charm still grips the mind with its fascination.

There are certainly few more delightful studies. The delicacy, the fairy wonder of the minute, painstaking work, the wonderful depth of tone even in the plain black lacquer is a matter to be marvelled at for ever. The thrice marvellous splendour of *nashiji* in all its grades, the choice daintiness of, and exquisite skill displayed in, *togidashi* work are beyond words.

But these are merely names to thousands, who, if only they understood, would probably be fired with the "divine fervour" of collection. In no way can the full beauty of these things be written; but some attempt perhaps may be made to show wherein lies their charm and fascination.

As an example let us consider the technique of a plain, black-lacquer box, devoid of all decoration. Such a box should not be handled except with a soft cloth for the slightest touch marks the beautifully polished surface and is extremely difficult to remove. Let us think of this box as a finished article,—plain indeed but with that air of distinguishment which is the unmistakable hall mark of quality. Look carefully into its glossy surface and you will find *real* depth. And it is real, for, if the piece be a fine one you may be looking down through anything between thirty and sixty layers (*makiye*) of transparent, or rather translucent, lacquer. Look more closely still and you will see the actual texture of the fine fabric upon which the first layer was spread. It is a revelation to one who has it pointed out for the first time. Of

course, this great transparency is characteristic of only the very best work and many other qualities go to make the sum-total of its excellence. It is necessary to know the process through which a piece invariably passes to appreciate this.

Let us suppose a box,—perhaps a *Kogo* or box for perfume, the size of an ordinary match box. It is probably of Japanese white Pine, which is the wood most favoured although other woods are used at times. The wood, of whatever variety, must be well seasoned in the highest degree. Upon this depends the whole success of the future work, in so much as, if it were not, warping would result and the superimposed layers of fine hard lacquer would crack and sunder at the corners. This is seen in inferior work frequently, and occasionally in really fine examples where an error in judgement in selecting the wood has resulted in the spoiling of an otherwise excellent piece.

Well-seasoned, very thin wood, then, is the ground-work. This is joined most accurately and cemented with lacquer, which it may here be explained is the sap extracted from the Lacquer-tree (*Urushi-no-ki*), the *Rhus vernicifera* of the botanist. This sap is drawn from the tree at stated seasons, April and October being considered the most favourable months. In its natural state it is of light amber colour, but it is variously coloured for decorative purposes with gamboge, cinnabar, acetous protoxide, etc.

The plain wood box is first carefully covered with a coating, sometimes of paper, but in the case of fine pieces, with finely woven hemp or linen cloth. Here again, as in fact in every process relating to this art, great care is exercised. Not the slightest crease or bulge is allowed to occur. This covering is affixed by a cementing of lacquer, and a further coating is then laid upon its surface. We have thus a ground of lacquered cloth, which, when dry, is ground down with extremely fine emery until practically the whole surface lacquer is removed and

the cloth itself forms a hard smooth surface. Particular care is taken with the corners—much of the after elegance of the piece consisting in the absolute perfection of the finish. There is no minutest feature in a good artist's work that is not the acme of perfection.

The box is now ready for lacquering. If it is to be plain black it is now covered with a series of coatings of the varnish each most carefully laid on with a hare's foot. Not a brush mark should be evident. The slightest blemish in this respect would spoil the effect. Each of these *makiye* or layers of lacquer is allowed to dry, and is dried off in specially prepared chambers, for lacquer has the peculiar property that it will only "set" in a humid atmosphere and away from the light. Twenty-four hours is the very least time allowed for the drying of each successive coat and high class work is often left in the drying chambers much longer. When the first layer is dry it is polished with burnt ash, the hand being used as the most delicate possible of pads.

Each successive coating is thus carefully dried and beautifully polished, so that any one surface might be the final one from the care bestowed upon it. The fact that further coatings are to be applied makes no difference to the high finish given. It is this painstaking and seemingly wasteful application of care and energy which gives the wonderful effect of depth and translucence of which I have spoken. It is this, too, which makes it possible to see distinctly the cloth foundation beneath twenty, thirty, or more coats of beautiful warm black.

Inside as well as out the same high pitch of excellence is observable, nor is the under surface of any good piece in the least degree less finished than those parts intended to be seen. The art of preparing black-lacquer had already attained great perfection a thousand five hundred years ago.

Now let us suppose that the box is to be beautified by the addition of decoration.

There are many fine processes at the artist's command. The most familiar, and a very striking improvement is to make it what is termed *nashiji* instead of plain black. The name *nashiji* which means "pear-ground" is given from the fancied resemblance of a certain grade of fine *nashiji* to the beautiful bloom of a pear. It is a term sometimes misapplied even by those who should know better. Strictly speaking it is only legitimately applicable to gold on black. That is to say *nashiji* is sprinkled gold-dust, or rather fine fragments of pure gold-leaf in a matrix of black lacquer. But for convenience the term is sometimes used to designate analogous techniques.

The method of producing *nashiji*, the use of which dates from about the eighth century, is by blowing extremely thin gold flecks upon successive *makiye* during the process of varnishing. A small tube of bamboo containing a supply of gold is held in the mouth of the craftsman and by gently puffing, with great skill he blows the golden specks on to the moist surfaces. This being done on several of the uppermost layers the result is most beautiful. The gold specks seem to float in a transparent medium and the varying thicknesses of overlying lacquer tint some to a deep bronze, others to an amazing amber, while the pure gold sparkles in its own richness in the surface layers. It is quite impossible in mere words to describe the truly gorgeous richness of fine *nashiji*. In looking into its depths one is forceably reminded of the immortal words of Keats,—
"A thing of beauty is a joy for ever."

And yet, be it noted, this is generally only a ground upon which the artist,—the lacquer painter,—will put his decoration. This is the marvellous thing about Lacquer-work. It is perfect at whatever stage of the process you consider it. Completed it is a series of blended perfections.

Nashiji is sometimes thinly distributed,—sparse *nashiji*,—at other times it is so thickly powdered with gold that practically

none of the black matrix is distinguishable. It then has the appearance of a beautifully golden yellow with a mellowness of amber. This rich *nashiji*, however, is not to be confused with *ken-makiye*, which is gold-lacquer, of which more anon. Between these two extremes there are many grades, and a most effective variation is what is known as *mura nashiji*,—"clouded *nashiji*,"—from the fact that the particles of gold are not evenly distributed over the surface but are as it were puffed on in clouds, dense in some places and in others fading off into almost if not quite plain black. This type is most beautiful and effective.

Besides true *nashiji* there are varieties named from the foils used,—silver, pewter and even tin *nashiji*. There is, too, what may aptly be termed false *nashiji*, which is not *nashiji* at all but a common imitation only found in very inferior work.

Upon this ground, so beautifully prepared, the artist lavishes his greatest skill in painting either a landscape, a spray of flowers, some bird or animal, some mythological subject or merely geometric design. Often enough it is an impressionist sketch done with consummate art, but at times the artist is a realist, most minute, within the strict canons of Japanese art.

The ornamentation of lacquer, lacquer painting, came into vogue in the seventeenth century and by the end of that century had reached the zenith of its perfection,—producing such splendid examples as the Shogun Shrines at Shiba.

In the decorative schemes employed upon great numbers of articles the delicate fancy and poetic temperament of Japan's best artist's ran the whole gamut of individuality, and yet throughout there is abundant testimony to the fact that the canons of true art are never for one moment overstepped. The possibilities of this unique medium of art expression are marvellous in their variety and it is impossible in a mere word

description to give anything like an adequate conception of their beauty.

Often pieces are painted in gold lacquer in the flat (*hira-makiye*). Perhaps it may be a temple scene, Buddhist or Shinto, minutely detailed and skilfully executed, the whole effect being exceedingly rich, and, if the piece be an old one the gold is mellowed, so that the merest tyro would realise that here was an excellent piece.

This rich *hira-makiye* is frequently further enriched by the addition of *kirikane* which may perhaps be conveniently described as a minute mosaic of gold-foil squares laid on separately and in a certain order so as to enhance the high lights and bring out to a greater extent the beauty of the piece. This also applies to what is known as *takai-makiye*, or high-relief, which gives a still greater degree of embellishment. This is built up with a paste of lacquer, white-lead, camphor and lamp-black.

The infinite patience required for this work is self-evident and yet it is somehow taken for granted and is so admirably in keeping with every item of the technique of this truly wonderful art that it is accepted without wonder.

Silver and gold foil are both much used as a filling for leaves of plants and for other small flat surfaces in the decorative scheme. The use of these foils adds marvelously to the richness and elaborateness of the work and is very clear in execution.

Another very beautiful mode of decoration, as remarkable in technique as it is beautiful in effect, is what is known as *togidashi* work. At first glance it may be mistaken for ordinary (though very delicate) lacquer painting.

In effect the design is inlaid, that is, the picture, whatever the subject, is not painted upon the surface, but rises or, as it has been said, floats to the surface. The art of *togidashi* decoration is extremely difficult of execution and it is only found on first-rate pieces. It is comparable, in a sense, with

the delicate art of damaskeening, in that it requires most accurate and painstaking skill of hand to produce in the final effect that wonderful continuity of polished surface which is its ultimate beauty. *Togidashi* work is absolutely level and of one surface with the surrounding ground. It is practised in gold and silver lacquer and also various other colours, and is never common. It is always a feature of great beauty and perhaps the highest achievement of the lacquerers art.

Hirame, is a rich gold lacquer, while *ken-makiye* has a somewhat matt surface of metallic lustre. The former is often confused by amateurs with very dense grades of *nashiji*, but it is essentially different, being as it were body colour and not the accumulated effect of multitudes of minute particles. It is oftenest used as a ground but also occurs decoratively and is very effective. The bevelled edges of boxes, the rims of trays and the like are quite commonly *hirame*.

Kirikane also is occasionally employed in flat ground work but then generally as a filling for geometric partitions or for the grounds of *mon* (heraldic badges, a frequent motive of decoration). In such cases it is sometimes of silver, pewter and even occasionally of mother-of-pearl, which is an effective feature of quite modern work.

Details of decoration are often emphasised by incrustations of gold, silver, pewter, mother-of-pearl, stained bone, etc., which materially enhance the effectiveness of many pieces, although perhaps modern artists are sometimes over lavish in the use of these materials. I have in mind some pieces of the type of the *Korin* school which show much bold pewter work and mother-of-pearl. The latter is an innovation to pander to the tastes of the Westerner.

At the same time there are few more beautiful features of good old lacquer-work than a judicious addition of silver and gold, either in the form of foil or solid metal

incrustation. A rising moon in silver over a simple landscape in gold lacquer with *stratus* clouds across the black background of sky, the clouds in gold and silver *kirikane*, gives a deliciously charming effect, or tiny dewdrops of silver, standing upon the curved tips of reeds (perhaps *togidashi*) give a realistic touch. The employment thus of metals is sufficiently uncommon to make their use most striking.

Before quitting the subject of the technique of this art mention must be made of two other familiar types of lacquer-work. One, and more common, is what is known as carved-red lacquer. The process employed is different from that of ordinary lacquer. Instead of transparent *makiye* of infinite thinness and translucence we have a body built up of a thick red paste which is, when shaped and quite hard and dry, carved deeply, often with the greatest skill.

Carved-red is almost invariably admirable work and is always worthy of a place in one's collection. This type of lacquer has been made since the seventh century. Inferior work in imitation of true carved-red is sometimes met with. In this low-grade work the design is always inferior and stamped in, not carved.

Another very beautiful kind of lacquer is that known as *mokume*,—or mottled lacquer. As the name suggests the "body" of the piece is a series of variously shaded lacquer layers, which, in the process of carving, particularly when the cutting is deep, has a most beautiful effect—the variously coloured *laminae* being exposed.

One of the great charms of the art of lacquer-work, from the connoisseurs point of view, is the great number of objects that are easily collectable. The variety of shape, size and use of the multifarious pretty little boxes for instance is a feature adding greatly to their charms as objects of art.

As an example the *kogo* or perfume boxes are of all conceivable shapes and many

sizes. But they are all alike in being dainty and of great beauty. Rectangular and square are, of course, quite common types, but pleasing variations even here are introduced by daintily bevelled corners of *hirame* delicately ornamented with *karakusa* (a small floral design which is quaint and exceedingly decorative), or rounded or inturned corners. Sometimes a modified form of the cube is found where we have two cubes as it were merged into each other. This idea is also sometimes carried out in fan-mount shaped boxes.

It is quite impossible to describe all the quaint shapes. Boxes in section the shape of a cherry blossom (a very favourite plant) or chrysanthemum (the royal flower) are met with. But perhaps the most charming form is what is known as *mokko* shape, which may best be described as rectangular with slightly rounded sides and incurved corners. The shapes of familiar fruit are also employed occasionally.

Another charming little object easily collected is the *Cha-ire* or tea-jar, which shows perhaps less variety of shape but is always charming in form. Some very clever imitations of Bizan stoneware jars are met with which may be classed as *Cha-ire*, the realism of the imitation being carried to the length of actually reproducing the unequal glazing and the long streaks of thick glaze running down the sides, just as if in the process of firing the glaze had run before setting.

Less dainty but much more elaborate and always richly decorated are the *kwashi-bako*, or cake-boxes, and the writing-boxes. *Kwashi-bako* are composed of a set of tray-like sections, each fitting most cleverly on to the one below it so that the whole forms three or more compartments designed to hold various species of dainties.

The writing-boxes are invariably the pride of a fortunate collector's heart. Much elaborate and choice workmanship is bestowed upon them, so that they are always

objects of great beauty. Upon them seems to be lavished the lacquerer's greatest skill. One can imagine the exceeding pride of the Japanese scribe of wealth with one of these beautiful boxes by his side. He would derive as much delight from the appearance of it, apart from its usefulness, as a Westerner from his heavy gold inkstand or richly chased fount-pen. A complete writing box is composed of several parts. Within the box proper the most important feature is the inkstone—a rectangular or oval stone in which a well is sunk to receive the ink. This stone is slotted into either a loose framework or a brush-tray which often is partitioned off so as to form many little trays to hold odds and ends. Another important feature of the fitting is the water-vessel, often of floral shape and either white metal, silver gilt *shakudō* or pure silver. The ink, of course, is mixed on the stone; hence the water-vessel is a most necessary adjunct. The "pens" are brushes with light bamboo handles. It is characteristic of these writing-boxes that the inner surface of the lid is almost invariably most exquisitely decorated,—more so in fact that the exterior, which points to the obvious conclusion that the beauty of the box, open and in use, is intended to influence the thoughts of the scribe.

Bentō-bako,—luncheon-cases,—are another type of distinctly ornate production. They usually contain a set of trays for sweetmeats, plates (of lacquer) and a cup (also of lacquer). This leads me to mention the *Sake-cups*,—frail, very shallow and elegant little bowls, as it were, on a rimmed foot. They cannot but secure the attention and admiration of the collector of lacquer-work. They are often so thin that a puff of wind would be sufficient to blow them away. They are almost always cleverly decorated with some delicate design in gold, though occasionally with coloured lacquers, and I recollect one set, (they are generally in sets of three graded sizes), which was

entirely decorated with a most beautifully executed triple spiral starting from three tiny commas in the centre.

For use with these *Sake*-cups there are stands which may be described as trumpet-shaped. The cups are placed on these and handed round to guests.

Very charming indeed are some of the cabinets, which are met with of varying sizes. Upon them is lavished much skill and they are invariably most elegant features of any collection. The quaint conceit of having half-shelves at varying heights, and small cupboards with hinged doors or sliding shutters adds greatly to their charm. Bijou silver mounts, handle-rings and even locks are a feature of these as well as many boxes, smokers' cabinets and so forth.

But of all the objects fashioned in lacquer quite the most popular with most collectors are the *inro*, or "medicine cases."

To treat of these gems of art as they deserve would require a volume of considerable size. Those who are familiar with them can understand how it is that the acquisition of these little objects may become a passion. They are indeed worth it. For those who do not know what an *inro* is it may be explained that a complete one is a set of tiny receptacles—used for medicines or perfumes. They all (generally four or five) fit on to each other and are held together by a cord which passes through cord channels at the sides. This cord serves the double purpose of holding the tiers secure and of suspending the article from the waist belt. At the end of the cord should be found the *netsuke*, generally a quaint and delightful little carved figure, often lacquered, and serving as a button to hold the *Inro* at the belt. Unfortunately the *netsuke* is often absent or replaced by a cheap and modern button quite foreign to the *inro* itself and quite inartistic.

Every conceivable process of lacquer-decoration is found in a representative

collection of *inro* and although in general appearance they are all similar yet one needs only to visit some really good collection, such as the Salting or Alexander, (both at the Victoria and Albert Museum, London), to realise that each one is, in itself, unique and a perfect work of art.

Of course, an art so full of possibilities and of such highly decorative potentialities as this has been largely employed in Japan for the purpose of enhancing the beauty of the temples and shrines. The most celebrated perhaps is the octagonal shrine of the second Shogun of the Tokugawa dynasty,—Hidetada (Taitoku-In) 1605-1623. It is one of the most magnificent specimens in existence of fine gold-lacquer, and one of the sights of Japan.

The art was at its zenith during the period of the Hojo rulers, (xiii and xiv centuries,) but naturally the work of these "old masters" is rare indeed. In the feudal age of Japan soldiers wore quaint and cumbersome armour formed of scales of iron, steel or tough hide or shark-skin, etc., many portions of which were commonly lacquered. One may see such hanging on models in our museums and strange looking figures they make. But generally speaking it is only the more modern, (often quite modern), work that is met with out of Japan, except in the hands of wealthy collectors. For all this the art as still practised reaches a state of high artistic merit, as perfect in its modern expression as even the older work. In fact, not a little of the work of the modern school (notably the creations of Zeshin), are, in their way inimitable.

ECONOMICS IN THE WEST.

Utilisation of Sun Power,

London, 13th June, 1918.—We have heard a good deal of late about the importance of the development of water-power as an instrument in promoting the success of industry especially in India. Now it is the turn of sun power to assert its claims to consideration amongst the new ideas of this wonderful time. The latest reference to the possibilities of the utilisation of solar agency for industrial ends is to be found in a very interesting report recently issued by the Commission of Commerce and Industry which has been sitting in Egypt under Ismail Sidky Pasha's chairmanship to investigate the extent to which the war has affected the commerce and industry of Egypt and to suggest new measures for the exploitation of Egyptian products and the replacement of enemy made articles, either by local products or by articles imported from friendly countries. The Commission as a result of their inquiries, have come to the conclusion that if Egypt is to occupy the economic position to which she is entitled she must enter upon a drastic reconstruction of her entire economic edifice. Formerly she used to export large quantities of cereals, but the success of cotton cultivation has made her to a large extent dependent upon that product and more and more she has to import not only the manufactured articles but also much of the food she requires. To change this state of affairs the commissioners suggest that she must develop her agriculture on broader lines and at the same time establish manufacturing industries. They are under no delusions as to the difficulties in the way of industrial development. Possessing no coal or iron deposits Egypt lacks what have long been regarded as the essentials of modern industry, but they are of opinion that these

short comings do not set up an insurmountable barrier to industrial development. It is practically certain that oil fields will one day be discovered in some part of the country. Water-power, again, may safely be looked upon as a means of working industrial undertakings, and lastly there is the sun which shines with full power in the Delta.

There is no suggestion in the report as to the exact means by which the sun heat may be utilised to produce energy. But in the past successful experiments have been made with refracting glasses which have concentrated the sun's rays on particular points and there produced the requisite heat for the practical purposes of energy. This is the principle of the magnifying glass which boys of untold generations have used as a toy for burning holes in cloth and sometimes for playing tricks with comrades whose hands they have scorched by directing the sun's rays through the medium of the glass upon them. No doubt the existence of coal in most industrial countries coupled with the lack of sun, or at least the uncertain character of its action, have tended to keep in the background the idea of "harnessing the sun" as it may be popularly called. But now that India has entered the industrial lists, that Egypt is following in her footsteps and that other tropical lands are joining in the modern industrial movement we may confidently expect that science will direct its attention to the problem more closely. There can be no doubt that there are vast potentialities in this utilization of sun power. If apparatus can be derived, as it probably can, for applying the heat of the sun to raising steam or in some other way creating energy an immense fillip will be given to industry and also to agriculture whose processes of ploughing, pumping, etc., will be enabled by the economical and ready production of power.

THE LEATHER QUESTION.

"There is nothing like leather" says the old proverb, and a good many people are

echoing the sentiment in these strenuous war days when millions of men are using up leather in a fashion which would appal the economist in the piping days of peace. The leather question, in fact, is one of the absorbing cares of belligerent Governments and their anxiety is likely to extend long after the last shot has been fired in the Great War; for it is becoming increasingly manifest that there will for a long time to come be a real shortage of hides owing to the heavy inroads that have been made upon cattle stocks in Europe and the difficulty that will be experienced in replacing stocks of European leather from the local production. Some idea of the destruction that has gone on in the past four years may be gathered from the fact that it has been computed by a reliable authority that since the outbreak of war live-stock has been depleted to the extent of 28,000,000 head of cattle, 54,500,000 sheep and 32,400,000 pigs. The destruction in Russia has been enormous and it was from this country that before the war a large proportion of hides used on the European market were obtained. The moral of all this for those countries which are called producers is to strive to the utmost to increase their stocks. The demand must be very great for years to come and there need be no fear of overproduction. India, it is unnecessary to point out, has a peculiar interest in this question of leather production. As one of the great world producers of hides and a country rapidly developing a tanning industry she stands to gain enormously in the future by the demands created by the war.

PAPER MAKING IN INDIA.

It has been said that "dirt is matter in the wrong place." Soon we shall have some one declaring that "weeds are raw material run to waste." I make this observation apropos of a recently published statement that the weed known as twitch grass has been turned to account as raw material for paper making. This is a remarkable

circumstance if true for twitch grass is the bane of the English farmer. I am not sufficiently acquainted with Indian Botany to say whether the weed grows in India: probably it does not at any rate on the scale that it flourishes here. But in any event the use made of the material is worth noting as it may suggest a possible use of growths which at present like twitch weed are nuisances. It is true no doubt that the shortage of ordinary paper materials, which has led to this startling application of a common weed to serviceable ends, arises out of the exigencies of war and will not be permanent. Nevertheless, it will probably be a good many years before normal transport conditions are re-established and in the meantime there will be plenty of room for substitutes which have proved their value. And not only this there will be openings for material, not hitherto used for paper making because of its superior cheapness or higher standard of adaptability. The growth of paper making in India in recent years shows that this branch of industry is one which has appealed to the intelligent interest of capitalists. It should not be difficult to associate with it a comprehensive manipulation and exploitation of raw material for export either in association with the admirable experiments of the Agricultural Colleges or on the basis of independent data.

PHOTOGRAPHIC MATERIALS.

Amongst the branches of industry which have undergone a marked and salutary change in the direction of the foundation of a self-reliant position is that which has to do with the production of photographic materials. Before the war nearly everything came from abroad, mainly from Germany. To-day British manufacturers are producing the principal basic chemicals, such as amidol, metol and hydroquinone, which hitherto emanated from Teutonic sources, and we are also turning out the bulk of the photographic paper used and also based the manufacture which before the war had become practically extinct. Lord Rayleigh, the eminent scientist who as a member of the Advisory Council of the British Photographic Research Association has had much to do with these

striking developments told an audience the other day that there would be a great demand for a much more rapid plates if it were possible to get them. He remembered seeing an advertisement many years ago which announced "children by an instantaneous process." That had not been allowed, he said amid laughter; but they must keep an eye on all possibilities, joking apart there has unquestionably been an immense development of photography as a result of the war. The really wonderful pictures shown in connection with the different war exhibitions are a revelation of what the camera in these days can do.

THE DYE INDUSTRY.

Allied with the photographic industry in a scientific sense is the dye industry which the Government have taken in hand in order to eliminate the German interest. A good many conflicting reports are current as to the progress that has been made in the direction of independence. Mr. Arthur Finch who writes in the last issue of the *Financial Review of Reviews* is somewhat pessimistic. He acknowledges that "with the exception of a few brilliant shades, all possible shades of colour can be obtained within the range of dye-stuffs now being supplied by British manufacturers." He admits further that with the coming of peace it will be possible for many of the munition factories to undertake the production of dye-stuffs owing to the fact that they will possess big quantities of basic constituents of coal tar, such as toluol, benzol, xylol, phenol, as well as naphthalene and anthracene." Nevertheless, he is apprehensive that our equipment will not enable us to withstand the shock of German competition which will come in full tide as soon as the war is concluded and will not, he thinks, be stopped by tariffs. His principal ground for anxiety is that we are not training sufficient chemists for research work. How immensely important this is he illustrates by the statement that it cost the Germans a million sterling to produce a satisfactory synthetic indigo. There is no doubt a great deal of force in his arguments and the public will be none the worse for a little prodding. But that the British dye industry has come to stay I do not for a moment doubt. Our whole commercial prestige is involved in seeing that we are not thrust back again into the old groove.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Some of the Wonders of the Automobile Industry.

Washington, D.C., U.S.A., 15th July, 1918.—Some interesting statistics are to be found in the recently issued book "Wonders of the Automobile Industry," just published by the National Automobile Chamber of Commerce. It is shown that the number of employes in the industry in the United States is 850,000, and that they and their dependents would populate the city of Chicago, or Philadelphia, Boston and St. Louis combined.

The annual wages—\$747,000,000—are approximately equal to all the gold in circulation in this country.

The capital employed—\$1,297,000,000—is greater by \$250,000,000, than that of all the national banks; greater than the combined capital stock of the Pennsylvania, New York Central, Chicago and Northwestern, and the Chicago, Milwaukee and St. Paul Railroads, and is more than twice as great as the capitalization of the Standard Oil group of thirty-five companies; also four times as great as the combined capital of all the steel companies, with the exception of the United States Steel Corporation.

The number of passenger miles by automobile is not less than 10,000,000,000 per year than that of all the railroads.

The seating capacity of the automobiles in America is 25,000,000 persons, compared with 3,500,000 for the railroad cars. If the railroads would undertake to handle the number of persons now carried by automobile in America it would require duplication of all their passenger locomotives and cars, at a cost of more than \$1,000,000,000, as well as duplication of its passenger tracks, depôts, employes, at an expense impossible to calculate.

Assuming that the army of 1,000,000, men had been mobilized on the first day of October, America's automobiles travelling at the rate of 100 miles a day with four passengers to the car could have carried every man in the army 600,000 miles up to the end of May.

A WAY TO FIND THE DIRT.

One of the essentials of a modern factory is sanitation, and the leading manufacturers of this country have reached the conclusion that the chief aid to sanitation is a liberal use of paint. The prevailing idea of a decade ago, that the best way to get rid of dirt was to sweep it into a dark corner, has given place to the belief that all dark parts of the factory interior should be painted a light gray or white.

This method allows the dust or scraps to be easily seen against a white background, and the sweepers in their daily round of the factory are less likely to skip the dark corners. As a result of this use of paint the appearance of factory interiors has been considerably improved and the health of the workers has been likewise much bettered due to the absence of disease-breeding germs.

The presence of these germs, or bacteria, as the scientist calls them, is the real danger resulting from the accumulation of dirt. Although, of course, the presence of dirt in corners detracts from the cleanliness and appearance, the vital consideration is the possibility of contagion among the employes resulting from the growth and propagation of disease-carrying bacteria which live in the dirt.

With the end in view of removing the dirt and bacteria, factory owners and superintendents have made the painting of all corners and dark places of the building compulsory at regular intervals. The results obtained in better sanitation has amply paid for the expenditure of money for paint materials and labor, besides the fact—and it is an important fact—that painted walls

add more light and thus cut down the bill for artificial light.

PLATING OF ALUMINUM WITH NICKEL NOW POSSIBLE.

The interesting announcement is made by a large Connecticut company that a process of nickel-plating aluminum has, after long series of experiments, been discovered. It is stated that the new process follows closely the standard process of electro-plating other metals, and that, so far as is known to the company, it is the only successful process in existence whereby aluminum may be plated with nickel, copper, silver, etc. It is applicable to aluminum in sheets, rods, wire, or tubing, and to aluminum alloyed with other metals as in moulded or die castings. It is claimed by the discoverers of the process that nickel-plated aluminum presents a very hard non-corrosive surface which is susceptible to a very hard finish and that the nickel-plated article is much strengthened by the nickel.

MAKING WALKING SAFE.

Attention has been concentrated upon eliminating many types of hazards and success has attended such efforts to a very great extent in this country. Many millions of dollars are annually expended in making buildings fire-safe. Re-inforced concrete, wired glass, kalamein doors and window frames are all very desirable; but it is evident from the seriousness of the "slipping" hazard and the position that it occupies on our casualty lists, that we must have more action in an effort to make walking safe.

More than twelve times as many people are killed by falls on stairs, floors and sidewalks as there are from burning buildings. Wherever people walk and work every surface of cast iron or steel is a hazard because a little oil, mud, soapy water or even constant wear makes it dangerously slippery. Metals should not be used for tread surfaces unless there is embodied in the wearing surface some effective anti-slip material. Tile and terrazza floors, because they are not

properly cleansed, frequently will cause falls and casualties. Soap powders should not be used to clean such floors, but rather some sort of gritty cleanser. If the floor has already become slippery through the use of improper cleansers it must be scoured and rinsed with warm water. By inspection of old structures and rigid supervision of new construction, slipping hazards may be eliminated, and it certainly is of vital importance to devote to this phase of accident prevention the serious consideration and unceasing attention it requires. Too much stress cannot be laid on the importance of using hand-rails on stairways. They are not there for ornamentation!

A NEW IDEA IN PHOTOGRAPHY.

Often a snap-shot made with a dollar camera in the hands of an amateur is superior to the handsome portrait of the leading studio. It is superior because it is natural; for as perfect as the photographic qualities of the studio product may be, it is generally artificial, so to speak. Especially is this true of children, whose best portraits are none other than the snap-shots made of them while at play. And after all the main purpose of a portrait is to present the subject as we know him, and not as he distorts himself before the studio camera to the tune of "Look pleasant, please," or "Watch the birdie."

To remove the artificial atmosphere from the studio, to eliminate "posing," and, in a word, to make portrait sittings a pleasure rather than an ordeal, has been the object of one of America's leading photographers, and after several years of experimentation and development this inventor has at last evolved a camera that appears to accomplish all that he has aimed to do. This camera is a cross between the studio camera and the motion-picture camera, for it photographs the subject many times on a glass plate, after the fashion of motion pictures, and then permits him to choose any portraits or "stamps" on

the negative, which can then be enlarged up to handsome photographs. There is absolutely no posing on the part of the subject, for he can chat, or smoke, or chew or joke while the photographer is registering the action on his negative.

The new camera makes use of standard glass plates, held in plate holders of more or less standard design. By means of an intermittent movement the glass plate is moved in steps from right to left past the lens to register the first row of images, and then dropped down and moved from left to right for the second, followed by another drop and a right to left movement for the third row, and so on until the plate is entirely exposed. The movement, which consists of an ingenious arrangement of gears, chains, ratchets and dogs, is actuated by a hand-crank at the side of the camera. Numerous adjustments of marked simplicity permit the photographer to arrange the movement for any number of images from two to more than one thousand on a 5×7 plate, or from a $3\frac{1}{2} \times 5$ image to a pin-hole image, with the same lens, by means of the adjustable slides of the aperture. Again, the images may be made at any speed desired, ranging from eight to sixteen per second. Or, if the photographer desires, the images may be made one at a time by a single picture movement.

Just behind the lens board of the new camera is a compartment containing part of the plate-shifting mechanism and the revolving shutter. The latter is similar to those employed in motion picture cameras, being provided with a single slit or opening of variable size so as to permit of a wide latitude of exposures which may be necessary in changing from large images to microscopic ones. A lever, connecting with the shutter, is arranged to be fastened at variable distances from the centre of the latter, so as to alter the rate at which the pictures are made.

ALCOHOL AS AN AUTOMOBILE FUEL.

Although the United States produces about two-thirds of the petroleum of the world, and turned out more gasoline this year than ever before, investigations are being carried on with a view to exploiting the use of mixtures of alcohol and gasoline in motor vehicles. It is now definitely established that alcohol can be blended with gasoline to produce a suitable fuel that will avoid the difficulties of starting a cold motor on alcohol alone, and without any change in the carburetor or the compression of the engine. The production of industrial alcohol on a large scale would accordingly help materially to increase the supply of motor fuel.

Nearly all the automobiles in Norway and Sweden are operated on alcohol made from waste sulphite liquor from pulp mills. Alcohol is also used in automobiles in Spain, where the sale of gasoline for use in passenger cars has been prohibited.

Alcohol can be produced at the pulp mills in the United States at a cost of 15 to 20 cents a gallon at the present time, and if all the paper mills suitable for the purpose were equipped with the necessary plants they would have a combined capacity of 15,000,000 gallons a year.

Waste from sugar mills and waste vegetable products provide other sources for the production of alcohol. Distilleries and breweries whose business is being curtailed by the movement of prohibition throughout the world, have the apparatus and skilled labor requisite for the production of industrial alcohol from their wastes.

A COLLAPSIBLE WASH BASIN.

A patent has just been granted here for a unique wash basin of the collapsible type, designed to fold into a roll 2x8 inches. This is said to be an ideal basin, thoroughly practicable and serviceable for travelling outfits, for campers and for motorists on long trips. The steel frame of the basin is collapsible, but when opened it holds its

shape rigidly. The container is made either of double-coated rubber or of water-repellant canvas. In the former case it has a diameter of thirteen inches and a height of five inches with a capacity for one gallon of water. Its weight in this style is but seven ounces. The canvas bag is fifteen inches in diameter, with a height of six inches and a capacity of a gallon and a half. It weighs exactly as much as the rubber container.

TWENTY-SIX THOUSAND MILES WITHOUT MOVING.

A 26,000-mile endurance run without leaving the display room is the feat recently performed by an automobile in Boston. In arranging for a test which would show the staying qualities of their car the manufacturers wished to secure the maximum of publicity before the crowds which daily passed their show room. So they brought a car out of stock, blocked the wheels clear of the ground, and belted the rear wheels to a 17-kilowatt generator. The electrical load on the generator was fixed at such a value as to put a load on the automobile engine equivalent to that caused by the car's climbing a 10.5 per cent grade at about twenty-two miles per hour at high gear, part of the power generated being used to light the show room inside and outside. During the test period the motor was under continuous observation by newspaper men, automobile experts and technical men from the various institutions in and around Boston. Most of the time the crowds in front of the window rendered it difficult to get near the glass.

During the run, and before it was stopped, the car covered a distance equivalent to 26,149 miles and consumed 1,163 gallons of gasoline, an average of 22.49 miles per gallon. The oil consumption was 220 pints, being 950 miles per gallon. The distance exceeds the previous record for non-stop runs by over 4,000 miles.

For automobile testing the electric generator furnishes an ideal load, as it is easily

installed, readily adapted to give any load within its capacity, and once this adjustment is made it does not change or vary. In fact, where direct is supplied for general lighting and power purposes the generator may be connected so as to return to the lighting system nearly all the power generated by the automobile engine. In this manner the cost of the test may be cut down considerably. These advantages are realized by the manufacturers of automobile engines, who use electric generators to a very large extent for testing their machines before shipment. A direct current machine is used first as a motor to start the gasoline engine and run it until the cylinders have become somewhat ground in. By merely moving a rheostat handle the load is then placed on the engine and it is run driving the electric machine as a generator during the remainder of the test.

RAILWAY ELECTRIFICATION AND COAL SAVING.

Mr. E. W. Rice, president of the American Institute of Electrical Engineers, recently referred to the value of railway electrification as a possible future opening for coal saving in the United States. Much has been said on the economizing to be made by cutting down lighting, which, however, was only responsible for 2 per cent total coal consumption. But the consumption by steam-driven railways amounted to 25 per cent of the total coal mined in this country, and the coal was used under such inefficient conditions that six pounds were required per horse-power hour. Electric traction could boast an efficiency three times as high. Accordingly, if all the railways were converted to electricity a saving of nearly 17 per cent of the total coal consumption could eventually be made—far more than could be achieved by suppressing lighting altogether.

ALFRED T. MARKS.

NOTES.

It was a most interesting address that Mr. Banerji delivered the other day at the opening of the Mysore Dasara Industrial Exhibition. We are printing the address itself in another part of this issue. Its main interest centres in the justification it affords for the work of the Mysore Economic Conference. The Conference anticipated the work of the Indian Industries Commission in one aspect of its activities. As Mr. Banerji points out the work before us is even more important than what has been so far done. The spade work done by the Conference has been of great use and will, to a large extent, help towards building up the activities of the country on the only lines on which they should be cast. It is up to every one of us in the State to do his mite towards achieving the high ideals underlying the Conference. If there is greater co-operation between workers in the same or allied fields of activities and greater co-ordination of those working in different but necessary lines of work, the day is not far distant when this country will have reached a high state of efficiency.

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Addressing the Dasara Representative Assembly, Dewan Sir M. Visvesvaraya once again reminded the people of the State of the main objects of the economic policy pursued by the State. These are, he said, augmenting agricultural produce; increasing production in industries and manufacture; promoting trade and extending education and vocational training. As he rightly remarked a substantial beginning has been made to promote all these objects. But still a great deal yet remains. These can only be achieved by steady work. Airy talking about progress leads to next to nothing. What is primarily required is more and more definiteness in what is aimed at. As was well pointed

out by him, "no large or rapid progress is possible without definite objectives, well-defined methods of work and an adequate and efficient organization. It is necessary to place some definite standards before the public, some clearly defined aims for their guidance." As instances of what he meant by standards, he said one was to double the agricultural produce of the country in ten years; another to induce every family in the village to lay by enough food grains or money for maintaining the family for a couple of years so that, in times of short rainfull, it may not run the risks of starvation; a third to double the present school going population in five years; and a fourth to increase the number of persons engaged in industries and trade eventually to 25 per cent of the total population. These are verily definite and he would have all work towards achieving the results aimed at.

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How to do this? "We must," he says, "shape our habits and methods according to the latest experiences of progressive countries, particularly in respect of corporate discipline and collective morality which are new to our people. The importance of working together in large numbers and pooling resources and capital should be brought home to all. Education should come to be regarded as an investment and accepted as a birthright of the meanest citizen in the land. Science and the use of machinery should be made subjects of popular knowledge. A persistent effort should be made for adequately training adult workers in their respective trades and callings. Standard business ideas and practices should be spread by lectures and leaflets among the entire population."

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Those are the essential ideas. What of organization? Here is what he says of it: "Our central organization for economic work is fairly complete. The arrangements for associating the mofussial population

with the central organization are being perfected. A scheme to enlist the services of a large number of workers in the activities connected with Education, Agriculture, and Industries and Commerce, has been sanctioned and is making progress. Helpers and associates are classed into three grades according to the standard of work expected of them." It is doubtless true that the organization for local work requires further development. The Progress Committees and unit areas have at present no specific executive agency to reach the cultivators. It is suggested that we must have one official in each *hobli* (or section of a taluk), for propaganda work, to ascertain the wants of the rural population and furnish statistical and other information to the central agencies. If was suggested, the official is chosen from within the *hobli* itself, we shall be creating an active agency for self-improvement in each local area.

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We have from time to time published in these columns extracts bearing on the subject of Reconstruction in the western world in matters relating to Agriculture, Education, Trade, Commerce, Development of Natural Resources, Industries etc. We have also published the various reports issued by the Empire Resources Development Commission. Sir Visvesvaraya in his Dasara Address referred to the subject briefly but pointedly. What he said is of special importance because of what has been frequently remarked in these columns. "The idea of reconstruction," he said, "has a special meaning for us in Mysore. Some three years before the war, we began to take stock of our economic position. We found, by comparison with advanced countries, that the extent of education in Mysore was roughly about one sixteenth of what it should be and in regard to earning power, we stood in the same or worse position. We now know that economic efficiency and education go hand in hand,

and that by neglecting education in the past we have stood low in the scale of productivity and earning power. In economic matters, therefore, it is a case of construction, for us, and not 'reconstruction.' It is a case of beginning at the very beginning, to build up a new structure altogether, on modern lines." That is very true, for, when compared with the more advanced nations of the West, we are still on the threshold of our economic advancement. Sir Visvesvaraya made a stirring appeal ni concluding this part of his address from which we will only quote the following few sentences:—"We have made a beginning in organization and inducing people to work together. We have catalogued and placed before them problems of immediate interest. We have got together conferences, associations, committees and honorary workers in various parts of the country. We are taking steps to make all grades of the population, particularly the vast masses of agriculturists, to participate in the new activities and work to a common end. If the inhabitants all over the country consent to put their backs into the task and make a united effort, it will not be difficult to double or even treble production within a decade and create the additional wealth which the country so sorely needs." We feel sure that the response to this appeal will be both quick and adequate.

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An Australian correspondent writing in the *Times* Trade Supplement urges the Government to have a watchful eye over the new industries now under investigation. His remarks apply, *mutatis mutandis*, to this country as well. He says that in regard to new industries that the attitude of Government is the greatest of all questions. "If the movement is to succeed," he says, "it is requisite that it should have the sympathy and help of these (Government) Departments. because of the absolute control over trade now wielded by the Government." This

appeal is of wider application, and we might state that without sympathetic Government aid, nothing in the industrial line is at all possible in this country. If one of the results of the Indian Industries Commission, if not the chief of its results, be this, then it would have served its purpose well indeed. In Mysore, we have already recognized Government aid as both necessary and expedient and the principle is likely to secure greater support to itself in the years to come.

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Those who want to emulate in trade and commerce ought to go to the Japanese for the example. The latest news about these intrepid islaners is that they are out on a "Commercial Campaign" in Canada. Their plan is, says a Canadian writer, straight forward, above board and withal aggressive and persistent.

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"Japan is determined to become a powerful commercial entity; every aim and effort is bent on that purpose," declared one prominent Japanese merchant who recently visited Toronto. "Heretofore, the powerful European concerns have had their resident managers in the Orient, and have reaped huge profits from their transactions. Now, Japanese merchants propose to handle their own business, and to enter into legitimate competition with those European houses located in Korea, China, Siam, and Japan. We have developed our industrial, commercial, and financial machinery along European lines, and are able to meet our competitors on common ground. We aim at dealing direct with our own customers, and at the establishment of commercial connexions that will have a permanent value. "Here is a case in point. For many years Japanese goods have been sold in Canada, but by the medium of United States houses. We want to deal direct with Canadian business men, and, although the condition of the shipping world is against our keeping up direct intercourse with

Canada to the extent we would like to, we have so developed our organization, and so created a need for Japanese goods, that when conditions are righted we shall send direct to Canada. Tremendous quantities of Japanese goods are already being sold in Canada, but the Japanese merchant wants to do the business direct."

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This shows the spirit which animates the Japanese. One way in which the Japanese have been trying to get into the Canadian market is worthy of note. Hitherto their principle was to appoint trade agents at strategic points. This is what they did usually in China but in Canada, they have found no use for it. At frequent intervals during the past three years Japanese Commissions, consisting of one, two, or three merchants, have passed up and down the country obtaining first hand information regarding immediate needs, prices, how the goods ought to be packed and the best means of getting delivery. Not a detail was overlooked so that when these gentleman went back to Japan, or perhaps to some American point, they were able to impart valuable trade information to their houses, and the result was that they speedily obtained customers.

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To compare small things with great, can we not adapt the above Japanese policy in regard to our trade with British India, for instance. We have had Trade Reporters at certain important centres and have had information as to prices, &c., sent out to us. Perhaps, we might improve our position by sending batches of our merchants to different Provinces in India and study the probable market there for goods. This might enable our traders and merchants to make more from their goods than they have been so far.

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In this number we publish among other articles of interest one on "Japanese Lacquer" by Mr. G. E. Bunt, to which we would invite the special attention of our readers. Mr. Bunt writes with first hand knowledge of the subject and his article is well worth careful perusal.

GLEANINGS.

In an article which Sir Charles W. Macara contributes to the *Textile Review*, he urges the cotton industry to take in hand at once the question of establishing a reserve of cotton. The price of raw cotton has soared to an almost incredible height, and the stocks available for the mills are being greatly depleted. He fears a crisis is again arising. Any surplus that may have been grown as a consequence of the exceptional prices ruling during the past two years, and that will be accumulated as a result of the enforced idleness of so many spindles and looms owing to war conditions, should be controlled by the Governments concerned. He also insists upon the urgent need for improved baling for the American crop. It has been demonstrated that, by increasing the density of packing, millions of pounds sterling would be saved yearly. The Egyptian gin-compressed bale is, he says, the best on the market, and he strongly recommends American growers to adopt that type of bale, "not in the remote future, but now."

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From Queensland come reports of successful experiments in manufacturing paper pulp out of "lalang" grass, which resembles very closely the "esparto" of Spain and North Africa, and which when dried before making it into pulp yields as high as sixty per cent of first-class paper-making pulp. The expert states that esparto is the best pulp known, and the lalang grass product is within ten per cent of the same value. There are millions of tons of this grass growing in Queensland. Three crops a year can be cut from it, and this plant is said to be otherwise a curse to the country. Chinese "barr"—Urena—and the Queensland hemp—Sid Retusa—are said to produce thirty per cent of first-class paper pulp.

Lantana, which is also regarded as a great pest, makes an excellent wrapping-paper.

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The Government of Madras have decided that experiments made by the Department of Industries for the last three years in the manufacture of pencils have reached a stage at which the industry should be handed over to private enterprise. The accounts for the seven months from the 1st September, 1917, show that the factory made a profit of Rs. 5,871, which represents over twenty per cent on an assumed capital of Rs. 50,000. The Government consider a private firm would increase the output, reduce costs, and increase profits. The difficulty of making satisfactory pencil leads having been solved in Madras the Government believes they can safely retire, and tenders are invited from private individuals to take over the factory as a going concern.

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The valuable effects of good lighting, both natural and artificial, have been well summarised in the Factory Lighting Code of the Illuminating Engineering Society of America. The resulting benefits are given as follows:—

- (1) Reduction of accidents.
- (2) Greater accuracy in workmanship.
- (3) Increased production for the same labour cost.
- (4) Less eye strain.
- (5) Better working and living conditions.
- (6) Greater contentment of the workmen.
- (7) More order and neatness about the plant.
- (8) Supervision of the men made easier.

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The Government of Madras has sanctioned the expenditure of Rs. 67,770 for the improvement of cotton cultivation during 1918-19.

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Cellulose from seaweed and a paper milk bottle are the latest additions to the paper industry extension.

A representative committee, appointed by the British Board of Trade, is examining the water-power resources of the United Kingdom, and the extent to which they can be made available for industrial purposes. The chairman is Sir John F. C. Snell, M. Inst. C.E., and the secretary Mr. R. T. G. French, 10, Princes Street, Westminster, London, S.W. 1. Mr. M. S. Montagu recently stated in the House of Commons that the Government of India propose to constitute a small committee of electrical, mechanical, and irrigation experts to visit the different provinces, and, after conference with the local officers, to examine promising sites and to report whether a detailed survey is worth undertaking.

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During the war attempts have been made to encourage the manufacture of sugar in Turkey, and, according to reports, with some measure of success, thanks to State assistance in every direction. The Government is stated to have given encouragement to the industry by granting exemption from taxation and other privilege of to sugar factories, while supplies of fertilisers and agricultural implements have been placed at the disposal of beet cultivators.

INDUSTRIAL PROGRESS IN MYSORE.*

MR. A. R. BANERJI'S SPEECH.

The following is the full text of the speech made by Mr. A. R. Banerji, C.I.E., M.A., I.C.S. at the Mysore Dasara Industrial and Agricultural Exhibition, on October 12th, 1918, in requesting H. H. The Yuvaraja to declare the Exhibition open:—

YOUR HIGHNESS,—It is to me a matter of no small pride and gratification that I am privileged as Chairman of the Dasara Industrial and Agricultural Exhibition to welcome Your Highness again, after a lapse of two years, to this Exhibition and to convey to you our loyal and respectful greetings. I thank Your Highness on behalf of myself and the Exhibition Committee for the great honour you have done us all by your encouraging and stimulating presence here today which we gratefully acknowledge as a token of your continued and unabated interest in this annual Dasara institution. When I stood before Your Highness and a similar distinguished gathering two years ago, to perform the agreeable duty of requesting you to open the Exhibition, I offered some excuse for the break in the continuity of this annual function. This year, my task is a more difficult one; for, while I have to plead justification for the decision arrived at last year to restrict the Exhibition to the Mysore State and to dispense with all the paraphernalia and formalities attached to the regular annual show, I have this year to make out a case for holding the Exhibition on a more pretentious scale, specially in view of the general economic unrest as well as agricultural distress, signs of which are in evidence at the present moment in some parts of the country.

As Your Highness said in your gracious speech on the last occasion, this Exhibition has come to stay with us, and has become a regular feature of our Dasara proceedings. In spite of war conditions, which led the authorities not to hold the Exhibition in 1915, the Exhibition of 1916 was a great success. The number of visitors was greater than ever being nearly 25,000 and the total number of exhibits about 20,000 of which nearly 5,000 were exhibits from outside the State. Although we restricted the Exhibition last year to Mysore products only and further developed the District Stalls

newly introduced in the previous year, we found that the popularity of the Exhibition had not abated in any degree—in fact the number of visitors beat any past record, being over 40,000. The decision of Government to hold the Exhibition as usual this year and to throw it open to all India was arrived at by Government when there were no dark clouds regarding the prospects of the season and general economic distress on the horizon, I am thankful to say those dark clouds have transformed themselves during recent weeks into rain clouds so dear to the heart of the raiyat. Be that as it may, the general policy has been to continue to regard the Exhibition as a regular and standing feature of our Dasara celebrations which attract a very large population from different parts of the State to this city representing all classes amongst His Highness the Maharaja's subjects and no more appropriate opportunity could therefore be found than the Dasara season to hold an Exhibition of this kind, to educate, enlighten and interest the people. Besides, it is no exaggeration to say that after four long years of grim struggle and untold sacrifices through which the British Empire and the Allies have fought in this great world-shaking war to uphold the cause of justice, humanity and freedom of nations, we at last see the first glow of the coming dawn. The cessation of hostilities between the Allies and Bulgaria and the victories in the Western front were signalized by the announcement of a public holiday throughout the British Indian Empire last Monday. In India, the Bharatavarsha of ancient fame and tradition, there is the quickening of a new birth felt throughout its length and breadth. In the march of events one is apt to get dazzled, lose focus of vision and the bewildering rapidity with which things are moving leaves one little time for solid reflection. But the whole world is at work producing schemes of reconstruction after the war, thinking out problems to be newly faced in view of an altogether altered political, social and economic environment. We in India cannot remain as idle spectators or mere thinkers on political and economic problems. The time for economic theories and discussions is past and that for action has come. The war has created a new position—so says the Reform Report. It has also opened up wider opportunities and it is for India as a whole to take them or not—opportunities for military service for the defence of the country, opportunities for self-government and opportunities for industrial expansion—opportunities for every man to rise to the full height of his stature and to develop as far as possible his economic value. The Dasara Exhibition should be a great lesson, a great source of inspiration in Mysore for

* Being the opening remarks made at the Dasara Industrial and Agricultural Exhibition on 12th October 1918,

workers and for her people at large, in this great crisis. It should bring home to our minds the lessons from lost opportunities and the failures of the past, our achievements of the present and the many hopes and possibilities of the future.

Here in Mysore since 1911, that is, three years before the war, the prophetic vision of His Highness the Maharaja outlined a scheme of work to speed up economic development amongst his subjects—a scheme which in its conception was as bold as it was comprehensive. Seven years have now passed and every one is to-day familiar with the ideas of the Economic Conference—ideas which, if then were characterised as visionary, now seem to be the nucleus of every Governmental scheme of economic development in India and elsewhere. The idea of holding this Exhibition to stimulate industrial and agricultural progress in the State was even older than the Economic Conference itself; so the Exhibition as a regular institution of the State can claim precedence by age and seniority: but as the greater will always absorb the smaller, so in the process of evolution, we find that this Exhibition is now attached to the Industries and Commerce Committee of the Economic Conference. Whatever may be its place in our organization for work, it is a most valuable institution and the situation created by the sudden economic and industrial changes all over the world at the present moment renders it justifiable for the State to hold this Exhibition this year also, and thereby demonstrate its various activities in different directions for the development of its own abundant resources according to the general policy of State aid and encouragement which it has carried out for some year past. It is essential that we should demonstrate what developments are possible in this country with our own resources and we must do so now and not wait till the war is over.

We have invited all India to participate in the Exhibition not merely from selfish motives; while we expect to gain by their experience and example, we are ready to show the fruits of our own labours in the State. The policy of industrial development foreshadowed in the Reform Report, as I hope to show later, is one that has been adopted and followed in Mysore for the past several years. British India and Indian States have watched our progress with keen interest. At this juncture, it will be to the advantage of all concerned to hold this Exhibition and I have no doubt that the good resulting therefrom will justify the policy of not allowing it to remain moribund in this year of great historic events, 1918.

I stated just now that the Reform Report indicates the future adoption of policy in British India

which Mysore has tried to follow for some years past. I may, in this connection, refer to certain facts regarding contemporary opinion and action in respect of economic progress in general and the ideals which we have already set before us here in Mysore.

It was only in March last year that the Dominions Royal Commission presented their final report on the natural resources, trade and legislation of certain portions of His Majesty's dominions to both Houses of Parliament. This Royal Commission came into being in consequence of a resolution passed by the Imperial Conference of 1911, was first appointed in 1912 and expended in 1913. The report, therefore, has the advantage of a comparison of the pre-war conditions with the altered circumstances likely to be brought about at the close of this war. The report has come to the conclusion that the existing organizations to deal with economic problems are inadequate, that there is scope and need for an Imperial Development Board which, without displacing any existing body, would devote its energies and experience to a continuous survey of the Empire's resources and opportunities. They have accordingly recommended the constitution of a permanent Advisory Imperial Development Board including representatives of the United Kingdom, India and all the Dominions, Crown Colonies and Protectorates with certain definite functions and responsibilities, chief of which are—to keep up an up-to-date survey of the relation between production and requirements of the Empire and to investigate into the possibilities of production within the Empire, of such essential materials and commodities as may be found, produced and controlled from outside and to prepare and publish statistics.

In December last year, another interesting report on commercial and industrial policy after the war was presented to the Prime Minister by a Committee appointed to investigate into the question and they have expressed the opinion that the establishment of any Imperial Bank for industries was unnecessary and that the financial needs of the industries of the country are likely to receive better examination and can be met in a more elastic and effective manner under private banking enterprise. They have also recommended that Government should encourage every kind of combination of manufacturers and others to secure supplies of raw materials and, as regards State assistance to encourage manufacturers, they have declared that Government financial aid is most desirable in some branches of absolutely necessary industry in order to compete with foreign capitalists. They have emphasised on the fact that it is necessary for a large number of young men and women to make

research their life-work after the war and that the Department of Scientific Industrial Research should be further developed.

I may also refer to a more recent report of the same kind namely, the report of the Commission of Commerce and Industry appointed in March 1916 in Egypt. Under commercial organization, the report has recommended legislation for the proper registration of traders and trading companies laying down conditions under which foreign companies may trade in the country. The Commission has also pressed for an extension of the country's production, and for the development of commercial education. They have also expressed the opinion that industrial activity will not harm agriculture. It indicates the possibilities under new industries, mentioning paper making, glass making, ready-made cloth, boot making, etc., and under State assistance for industries, the Commission advocates a revision in the customs tariff in order to encourage local products, the exemption of local industries from any excise duties, greater financial assistance in the form of subvention and advances to enterprises of public utility and of interest to industries, the establishment of a bureau, chemical laboratory for industrial research, organization of museums and exhibitions, creation of industrial co-operative societies and the establishment of an industrial bank. It emphasises on the importance of a proper and permanent organization for all such work to be exclusively devoted to the encouragement, development and direction of commerce and industry in the country. It advocates a separate Ministry therefor and quotes as examples for the Egyptian authorities the Ministry of Commerce and Industry in France, Ministry of Commerce and Agriculture in Italy and the Departments of Commerce in Mysore and Madras.

Coming nearer home, I may refer to the recent constitution of a Department of Industries and Commerce in Bombay and the appointment of a committee of officials and non-officials in that Province corresponding to our Industries and Commerce Committee. One of the functions of the Director in Bombay is the management of pioneer and demonstration factories in which new industries can be tried on a commercial scale and demonstrators, technical experts and managers can be trained. The Director there, is the Chairman of the Advisory Committee. The Government order on the subject refers to the functions of Provincial Directors as being under consideration of the Industrial Commission indicating thereby that the formation of a Government department in every Province for Industries and Commerce is a foregone conclusion. It may also be interesting to note that recently the

Government of India have issued a circular letter to Local Governments suggesting the constitution of Provincial Boards of Agriculture and organizing meetings thereunder, to which large landholders and representative agriculturists could be invited.

I may mention that a French expert has recently launched an important project in Bombay under the name of Indian Culture and Development Works Company with a capital of 25 lakhs, to manufacture on a large scale chemicals from the raw materials obtainable in India, to develop the industry of wood distillation and the recovery of by-products. It is under the management of expert business men including the Hon'ble Mr. Hajee Bhoj, the present Sheriff of Bombay. This company has obtained valuable concessions from the Indo-Portuguese Government and has secured in the districts of Goa and Satara, the exclusive right of using 50,000 acres of forest land for the purpose of manufacturing wood alcohol and other by-products. Recent developments in India in economic forestry may also be referred to. In Punjab and the United Provinces, we see attention being paid to resin and turpentine industry. Attention is also being paid in British India to establishing Government lac factories and to the manufacture of tea chests, straw boards, paper pulp and other allied products from bamboo and soft timber.

Chemical industries are sure to have a very important place in the industrial development of the country in the near future and it is easy to foresee the recommendations of the Industries Commission whose report is now due for publication, from the Address given by the President thereof, Sir Thomas Holland, at the Chemists' Conference at Lahore held on the 8th January last. Sir Thomas classified the chemical problems in connection with Government activities under several heads and grouped them chiefly under three, *viz.*, Agricultural Chemistry, Organic Chemistry and Mineral Chemistry. He foreshadowed a scheme under which it will be possible to prepare in India chemicals which are essential to the textile and other large industries, to assist firms with advice undertaking for them research work, preparation of drugs for the medical services and the systematic investigation of raw materials of considerable economic value. The value of industrial and scientific research is universally recognized in Canada, and a research bureau has just been established by the leading industrial concerns in that country with a subsidy of half the cost from the Canadian Government. There is a movement afloat in the Bombay Presidency to form a Syndicate amongst advanced Indian capitalists for the purpose of investigating commercial, industrial, mineral, agricultural and other projects and to work

such of the projects as after investigation, the Syndicate considers satisfactory. The scheme is an ambitious one and is likely to produce an industrial revolution on approved commercial lines, so far as undeveloped resources of the country are concerned.

I now refer to paragraphs 331 to 343 of the Report on Indian Constitutional Reforms which indicate the policy that has been recommended generally by the Secretary of State and the Viceroy in these matters. It has been held that if the resources of the country are to be developed, the Government must take action, that a forward policy in industrial development is urgently called for and that although there are difficulties owing to want of ready capital, distaste among certain communities for practical training, weakness of mutual distrust, lack of skilled labour, dearth of technical institutions, they can be overcome if the State comes forward boldly as guide and helper. The report recommends the expansion of the technical services, appointment of scientific officers and indicates progress in the direction of tanning, glass making, soap making, sugar refining, vegetable dyes, essential oils and chemical industries. The report recommends some of the recommendations of the Industries Commission and if we can read between the lines, it may be safely inferred that the Commission are in favour of the intervention of the State in industrial matters so as to render India as far as possible, a self-contained country. Imperial and Provincial Department of Industries are obviously contemplated and Sir John Barnes in his recent speech in the Legislative Council clearly indicated that Government attach much importance to the establishment of a Stores Department in India in lieu of the present India Office Stores Department in London. This will enable the Government of India to give very much greater patronage than has hitherto been the case to local manufacturers. It is equally obvious from the report that greater attention in the future is to be paid to the development of a rational system of industrial and technical education.

The summary given above of contemporary opinion of those in highest authority in this land as well as of Commissions of Inquiry in the United Kingdom and Egypt together with the particulars I have been able to gather manifesting recent developments and organizations for industrial progress throughout the country, give one a fair idea of what is now in the air.

Let us turn for a moment to the ideals which we have set before us in Mysore during the past few years and the practical results that have been achieved in the various branches of activity in which the State has taken special interest with a view to

see how far those ideals fall short of, or go beyond the generally accepted principles enunciated elsewhere. Mysore started an organization in 1911 as we all know in the form of an Economic Conference to associate men of all classes—agriculturists, merchants and public-spirited citizens—with the officers of Government in deliberations connected with economic progress. In opening the Conference, His Highness the Maharaja referred to the need for greater attention to industrial and commercial development and for providing a proper organization so that both the officials and the public might give to questions connected therewith the increasing attention that they deserve. It cannot be gainsaid that a careful examination of the work of the Conference and the agencies connected with it discloses a pretty wide field of operations. It has, for instance, taken the initiative to establish a Bank of Mysore and the University of Mysore. In regard to the introduction of compulsory education, pioneering and development of large industries such as the Sandalwood Oil Factory, the organization of a Department of Industries and Commerce, the development of sericulture, collection and spreading of information and statistics and the development of co-operation, it has rendered much useful service. Last but not least, it has caused a general awakening and quickened the sense in the people to follow industrial pursuits.

The Conference has a duly recognized constitution of its own and is split up into three Central Committees under three main heads of activities—Education, Agriculture and Industries and Commerce. The functions of the Conference and of its Committees are regulated by precise Government orders and although there has been a certain amount of over-lapping, considerable work has been done with the co-operation of the Heads of Departments concerned in the general work of development. There are, besides the District Committees, the Taluk, Town or City Progress Committees in the chain of organization; and Government appointed after three years' experience, an officer for each District to assist the Heads of District in stimulating and systematising Conference work, designated as District Economic Superintendents. Last June, His Highness the Maharaja was graciously pleased to give the assurance that the Economic Conference in some form or other would be made a permanent institution in the State. With this assurance before us in which Mysore is only anticipating what other Governments and States have in contemplation, as well as the experience that has been gained during the past seven years of work, there is every hope that Mysore will be in the forefront of States and Governments in having evolved a satisfactory scheme

of a permanent organization for the general economic development of the country.

Every one here is fully conversant with the working of this organization but it may be of interest if I refer briefly to some of the more recent developments under its activities and specially those of the Department of Industries and Commerce, during the past two years, to show that we are more or less familiar with the ideas that we now see recommended for adoption elsewhere. Besides the investigations carried out to prove the possibilities of new industries and the development of existing ones, the Mysore State has recently embarked upon a big scheme for the manufacture of iron in the Shimoga District. They have successfully established a factory for the manufacture of sandalwood oil on commercial lines after the necessary investigations and experiments. The factory started work in May 1916 and till the end of August 1918, 188,784 lbs. of oil have been manufactured from 1,902 tons of sandalwood. Our gross receipts were Rs. 37,67,090 in addition to which, during the same period, the Forest Department has realized Rs. 23,08,715 from the sale of 1,347 tons of sandalwood, bringing the total gross revenue in two years to 61 lakhs of rupees as against the average ordinary sandalwood revenue of the Forest Department of about 15 lakhs per annum. These figures do not include the value of stock still in hand.

The Industries and Commerce Department is now made responsible for the development of a Central Industrial Workshop in the State and for the establishment of District Workshops in the headquarters of each district. One of the chief objects of this Workshop is to manufacture machinery locally with a view to afford facilities for industrial development. Considerable work has already been done in this direction for the Agricultural Department and a very large number of improved agricultural implements have been manufactured in this Workshop and supplied to the raiyats. The departmental stall would show evidence of activity in other directions and I may mention a woollen carding mill, flour mills, pumps, sugar-cane mills, oil filler presses, paddy separators, lathes for botton making and soap plant. This Workshop is also manufacturing mathematical and scientific instruments and it is in contemplation to attach to it a Stores Department which, while not competing with private enterprise, will enable both Government as well as the people at large to readily obtain supplies for all their requirements under machinery. The department has successfully established a Soap Factory which has been working since February last. During the four months ending 31st July 1917 nearly Rs. 20,000 worth of soap was manufactured and sold in the

market. Further developments are in view in this factory and attention is being paid to the manufacture of caustic soda and the recovery of glycerine. The department has a large Central Weaving Factory under its management in which goods of the value of nearly Rs. 35,000 were manufactured during last year yielding a profit of about Rs. 4,500. Much experimental work in designing suitable machinery for warping, sizing, silk twisting and winding was successfully carried out and Government have recently passed orders expanding the operations of this concern with a view to bring it more in touch with the rural weaving population and afford them greater facilities to obtain the supply of raw materials and to market their goods. Through this agency, over 2,000 fly-shuttle looms have been supplied throughout the State. With a view to take more vigorous measures to meet the present crisis regarding cotton cloths and to increase the supply is possible, Government have recently appointed a special committee with Mr. Chatterton as the Chairman to investigate in the matter and to go particularly into the question of the development of hand-loom weaving and the marketing of finished goods. The department has recently started a Government Metal Factory which is capable of turning out about Rs. 10,000 worth of goods per month. It has also got a Button Factory and Arts and Crafts Institute and is, besides, engaged at present through a special agency, in supplying the Indian Munitions Board with army blankettes through the hand-loom weavers of the State. Till the end of August, nearly 13,000 blankettes were supplied at a cost of about Rs. 75,000. This business has opened up possibilities for further development in regard to the manufacture of blankettes, rugs, etc., of standard design and the Director is exhibiting a loom in this Exhibition on which such work could be done satisfactorily.

Under sericulture, important experiments are being carried on in co-operation with the Agricultural Department. The silk industry in Mysore has almost an unlimited scope and a forecast has been prepared indicating roughly the increased production which might be expected under proper guidance and supervision. The present area under mulberry is about 35,000 acres, the estimated value of silk produced out of which is 60 lakhs. The number of persons engaged at present in sericulture is 120,000. The Tata's Silk Farm near Bangalore is doing very useful work in the direction of introducing improved weaving and reeling. Further developments are in view and it may not be long before a silk filature on proper up-to-date lines is established in Mysore.

There is a great scope for the development of leather industry in the State as the export of raw hides from the State during the last year amounted

to nearly 72 lakhs of rupees. The Mysore half-tanned hides get a fair quotation abroad and the tanning industry, though placed under restrictions on account of the war, has a bright future before it. Proposals for the employment of a leather expert have been submitted to Government by the Industries and Commerce Department and some practical action in this respect may be taken in the near future. The Mysore Tanneries in which Government retain a fair proportion of the total invested capital as shares, have done fairly good business during the past year and there is no doubt that, with the guidance and advice of Mr. Chatterton who has been recently appointed as one of their Directors, the affairs of the Tannery will show further development and improvement.

Besides pioneering work, Government have been rendering substantial aid by way of expert advice as well as subsidies to several other industries in the State. I need mention under this head, the Bangalore Pharmaceuticals in which special attention is being paid to the manufacture of indigenous drugs out of the country's raw materials, tile industry, cotton seed and other oil industries, rice mills, flour mills sugar crushing mills, match factory, printing presses, ginning factories, etc. The total amount of takavi loans sanctioned under this scheme introduced by Government in 1913 up to the end of last year amounted to Rs. 4,34,000 and they fell under no less than 24 heads. There is, besides, a scheme for the advance of smaller loans to the rural and industrial population under the authority of local revenue officers which may, however, be still considered to be in an experimental stage.

With the assistance of the Industries and Commerce Committee an attempt was made to establish on commercial lines the paint industry and from the particulars I have recently had from the promoters of this concern, it is satisfactory to note that the business is growing and that it is proposed to increase the scale of operations in the near future. The Exhibition buildings have been painted with the colours manufactured by the Mysore Royal Paint Works which will demonstrate the nature and the quality of the materials that can be obtained from this firm.

The mineral resources of the State are being developed gradually. The total output of gold till July last came to 13,172,980 ounces and the total royalty paid to the State during the same period was £2,605,798.

Besides the development of the iron industry to which I have already made reference, the department of Geology is at present engaged in the investigation of bauxite, limestone, magnesite, kaolin,

asbestos, graphite, sodium carbonate, and different kinds of ochres throughout the State. Considerable activity is in evidence to discover suitable deposits of kaolin which may be used for the manufacture of porcelain, firebricks, crucibles, etc., and there is a proposal already before the Government for the establishment of a porcelain factory based on the discovery of a very valuable deposit near Bangalore.

To Mr. L. Vardhamanaiya one of the enterprising members of the Industries and Commerce Committee credit is due for the development in its initial stage of the asbestos business in the State. During the past year or so, he has mined nearly 300 tons of this material and has made investigations to prove that it is as good, if not superior, to the imported material. This Exhibition will show some of the products manufactured by him such as asbestos boiler composition, chrysotile packing for glands, asbestos wool for filtration, asbestos bricks for lining of boilers, etc., which it is hoped will be an object lesson to others inclined to similar enterprises in the State.

Considerable attention has been paid to the development of forest industries which has engaged the full time attention of a special officer since January 1917. It is under contemplation to appoint a Forest Chemist and a Forest Engineer to develop further economic forestry in the State. Schemes for bamboo pulp, paper factory, straw board factory, match factory, pencil factory, lac, dye and varnish factory, etc., have been investigated and much valuable information has been collected under all these heads. The difficulty chiefly lies in obtaining machinery on account of the war and as soon as that difficulty is removed, it is hoped that practical action will be taken in regard to all these schemes. So far as paper pulp is concerned, surveyors are already engaged in making a valuation survey of the whole of the bamboo area which is to supply the raw material; Laboratory experiments were made for the manufacture of straw boards at the Indian Institute of Science and after they were considered successful, a straw board factory on a small scale has been established by Government in April last. Specimens of the boards manufactured will be on view at this Exhibition. The development of match industry on a factory scale and as a cottage industry is engaging the attention of the special officer and he has made calculations regarding the total available soft woods in the Mysore forests suitable for this industry. He is also at present engaged in negotiations to see if suitable machinery can be procured to start the factory. A sum of Rs. 5,000 was sanctioned for the training of poor families in match making as a home industry in

Mysore and Bangalore and the work is still in an experimental stage.

The Government had already sanctioned a loan of Rs. 15,000 for the purchase of machinery to establish a pencil factory; but this loan was not availed of. The special officer has found that there are suitable species of soft wood in sufficient quantities for starting a factory of a daily output of 250 to 300 gross of pencils and it is hoped that as soon as machinery is procurable, this industry will be started in Mysore.

Although considerable attention has been paid the larger industries and schemes as described above, the policy of developing home industries has not been overlooked. A large organization has been established for the development of home industries classes as well as home industries institutes in Bangalore and Mysore; and under the former, 22 different industries have been taken in hand and under the latter, about 1,200 home workers have been registered. An exhibition of the work of these classes and institutes will be found in the Education Court this year.

Government have passed orders for the establishment of a Central Industrial and Commercial Museum in Mysore and are developing through the agency of the Industries and Commerce Committee of the Economic Conference, museums at District Headquarters on the same lines. The question of organizing a central bureau of scientific research has already been referred to in the Dewan's speech at the Economic Conference of 1917 and the scheme is now almost ripe for the issue of orders. Industrial co-operation has not been lost sight of and the small beginnings already made in establishing industrial co-operative societies are about to receive an impetus by greater efforts being made in the near future, specially amongst the very large weaving population in the State who are badly in need of a co-operative organization. A general scheme of training is in operation under which selected men are sent to factories and institutions outside Mysore to learn special industries. A notable example of this is the case of Mr. Garalapuri Sastri just returned from Europe trained in chemical industries and specially in those of soap making, essential oils, perfumery, etc. The Mysore University has already introduced the degree of Bachelor of Commerce—a course of three years. An Engineering College has been started.

The investigation of new Hydro-Electric schemes to harness all the available water power in the State continues with undiminished energy. To encourage small industries, the monthly minimum was removed from small motor installations of 20 H. P. or less rated load, and the charges made on the basis of

the actual metre reading at 1 anna per B. T. U. To still further encourage the consumption of electric power by industries, specially the small ones, they are allowed to light the actual mill premises with power from the motor feeders at the same rate as the power consumed by the motors. A scheme for the manufacture of 10,000 tons of cyanamide is under preparation. A scheme for the establishment of a cotton mill is also under negotiation. There is also a scheme for the constitution of an Industrial Development fund—subsidized by Government through the agency of the Bank of Mysore—now under discussion. There is, besides, the large project of a harbour at Bhatkal as an outlet for Mysore commerce under active investigation.

I have attempted to make a brief and rapid survey of the different developments that are taking place in Mysore with a view to indicate the progress that has already been made in the State and the possibilities of action that lie before us for general economic and industrial developments. Much of this, I hope, this Exhibition will demonstrate, besides affording opportunities for comparison with similar developments outside the State. In my last speech at this Exhibition, I described Mysore as "this land of unlimited possibilities," and now that we see a general wave of enthusiasm in all parts of the world and in every part of the British Empire and considerable activity both on the part of Government as well as the people to push forward schemes and develop material resources of the country, it is not too much to expect that Mysore will not rest on her laurels of past achievements but put forth greater efforts on more practical and commercial lines to bring home to the larger population of the State greater economic prosperity. After this war there would be no standing still; every nation must either go backwards or forward in the race for national economic existence. Mysore having had the advantage of a good start under the auspices of a benevolent Government which is ready to spend and even risk money for the industrial education of her people, there should be no doubts or fears regarding the future.

While it looks so gratifying that everything here in matters economic and industrial is so progressive and there is such a tremendous activity and enterprise in developing large schemes, a few reflections, however, may strike the outside observer. Critics may ask are we making the people as a whole richer and happier or is it not just likely that only a few selected and privileged classes would share the benefits of the Government's policy? Is not that policy liable to be abused if sufficient care is not taken? They may think it necessary to sound a word of caution against a slavish imitation of Western me-

thods. For example Professor Radhakamal Mukerji in his work "The Foundation of Indian Economics" says,—“In the West, the enormous increase of wealth has not been able to do away with the appalling poverty and degradation of the labouring classes.” The modern economic problem as this author puts it in the words of Max Hersh “is that of the persistence of undeserved poverty in the midst of abundant wealth, of unemployment in the midst of unsatisfied desires.” It is difficult to agree with the writer, when he says that “the attempt to force systems and methods of industrial organization, economic arrangements and institutions which have admittedly suited a different geographical environment will always be futile” and that “the methods of western industrialism cannot be adapted without disintegration of caste and family,” for, no doubt caste is somewhat of a stumbling block against all united progress. The Professor, however, makes out a strong case to show that mere imitation of Western methods and ideals will go for nothing unless the social condition which affects mostly the submerged majority amongst the population is somewhat altered to suit those ideals. Further, one may rightly ask—are we going to develop industrialism in Mysore on communal lines or on lines of national unity and strength? I should say, surely on the latter; and if so, there is much that the social and civic progress movement in the State could do to pave the ground. The depressed and the poorer classes who will form the backbone of a future industrial Mysore have to be educated on practical lines, their living surroundings and mental outlook improved, their economic asset in the country truly gauged and made effective. There is some danger no doubt if industrial development is to be confined to the higher classes who were the first to take advantage of the intellectual movement in India, for, in that case, there may be the same trouble about wealth and poverty in a worse form in this country and socialism of a more drastic and a more morbid type may one day develop when it is too late to mend; besides, labour problems of a more serious nature which in perplexity will beat the struggle in the West between capitalists and employment may have to be faced. The burden of Professor Mukerji's argument is that these ultra-progressive Western ideas are at present unsuited for the bulk of these poorer classes and we have therefore to adapt for them a scheme of industrial development suited to their geographical and social environment. I partly share his views. Technical and commercial education there must be; and side by side, there must also be provided a wide and comprehensive scheme of practical training coupled with general education for the masses, thereby uplifting them extending to

them a sympathetic fellowship. This aspect of the case has not perhaps received in India the attention that it deserves. There is thus the fear in industrial matters of making the mistake of beginning at the top and not from the bottom. We may build commercial and technical colleges and get a large supply of scientific and business heads, establish bureaux of research, but the general level of education amongst the masses must first be raised before any work benefiting the bulk of the population can be accomplished. We are no doubt most strenuously paying attention to this question in Mysore through our Village Improvement and other schemes for the rural population of the State. But it cannot be too frequently urged as Professor Mukerji does that “the object of industry is not to make unlimited wealth for a few capitalists but to distribute it amongst all classes, not to encourage the growth of business ability and power of control amongst one class but to extend opportunity to all.”

Such work will eventually help the development of small industries for which I think India has unlimited scope and Mysore abundant possibilities. These industries can at once bring more money to the people at large and raise the average of their present earning power. Mukerji pleads eloquently when he says: “Broken homesteads and disjointed families, bankrupt zamindars and ill-fed middle classes, debilitated crafts and wasted lands, increased death rate and greater criminality, all alike demand definite plans of regional survey and corresponding re-construction.” Let us hope that with the lesson of the past and the inspiration for the future which this Exhibition may stimulate, this work of re-construction will continue to develop on right lines in Mysore. Above all, it is necessary to cultivate for the successful conduct of industrial enterprise two distinct qualifications urged with great emphasis by the great political philosopher John Stuart Mill, *viz.*, Fidelity and Zeal, and to eschew all conventional education, most of the shibboleths and the cant of the West, so superstitiously accepted everywhere now as the panacea of all evils but which are “as stale and unprofitable” when bereft of their soul and substance.

I beg Your Highness will pardon me for speaking at some length, but the occasion is one that gives a fitting opportunity to discuss these momentous problems. We in India are now in the parting of the ways and must take the right road to progress without even the slightest risk of making a mistake. Let us not imitate the “standardised semi-slums of Western progress,” to quote Prof. Geddes, but work out our own salvation on lines specially suited to our conditions, *viz.*, the conditions of our village

and rural population who form the vast majority in this country.

The Exhibition this year has been organized with a view to present in a prominent and concentrated manner the activities of the various Government departments in matters industrial and Your Highness will therefore see in the pavilions, the Public Works, Railways, Electrical, Industries and Commerce, Geological, not to mention Agriculture and Sericulture and some of the Minor Departments adequately represented. The Women's Section presided over by Her Highness the third Maharajakumari continues to take a prominent place in this Exhibition. The special feature of this year is that in addition to the district exhibits which are placed together in each class for the purpose of comparison and a healthy spirit of rivalry, these departmental exhibits have been specially requisitioned by us to give the public an idea of what is actually being done with reference to all that is being said in reports and speeches. Another special feature is the display of specially manufactured articles under textiles, metal work, artware, furniture, etc., in the district stalls of the State, by selected artisans who were given advances by the Exhibition authorities as an encouragement to show their best workmanship. We have, besides, arranged to have a few interesting demonstrations and I may mention only a few of them, *viz.*, demonstrations by the Sericultural Department, weaving demonstrations, demonstration of fruit canning, several demonstrations under machinery by the Public Works and the Industrial Workshop Departments, cane crushing, jaggery boiling and other demonstrations by the Agricultural Department, which has also placed in view in the Exhibition grounds a few typical demonstration plots. A few days during the next fortnight will be set apart, specially in the mornings, for interesting lectures by experts. We are fortunate in having secured Dr. Slater, University Professor of Economics, Madras, who has kindly undertaken to speak on the value of statistics in economic development. Dr. Sudborough of the Indian Institute of Science and Mr. Subba Rao, Principal of the Maharaja's College, have also consented to give addresses on industrial research at the Institute and Economic questions respectively. A programme of all the functions, *e.g.*, lectures, demonstrations, entertainments, as well as amusements is ready for distribution and the Committee hope that these will afford sufficient attraction to the visiting public.

On behalf of the Mysore Government and specially on behalf of the Exhibition Committee, I convey our thanks to the provincial Administrations and the Indian States who have so kindly taken part

in this Exhibition in spite of several difficulties and inconveniences of the present time, I wish also to convey our thanks to the Indian Institute of Science and the Kolar Gold Fields Mining Board for the assistance they have rendered and for agreeing to the suggestions made to them to send exhibits to this exhibition. The Kolar Gold Fields Court is a novel one and I hope will be a very interesting feature in this year's Exhibition. It will convey an idea of the stupendous industry that has been developed, an industry which is one of the best examples of enterprise and organization that can be found in any country in the world. I have also to express our hearty thanks to the Controller of Traffic, Simla, for having so kindly arranged on behalf of the Exhibition, to give the necessary facilities for transport without which it would have been impossible to collect a large number of exhibits from outside the State.

It is also my duty to convey our acknowledgments to the several Heads of Departments who have heartily co-operated with me in making this Exhibition a success. Mr. Lakshminarasappa, the Executive Engineer, Architectural Division, has rendered us most valuable service with his suggestions regarding and supervision over the construction of the Exhibition pavilions which will, I hope, be pleasing to the eye of the visitors. For the ungrudging labours and willing co-operation of our energetic Secretary, Mr. Balaraj Urs, to whose indefatigable exertions, bright and fresh ideas, I owe a great deal for the success if any, of this Exhibition, I take this opportunity of recording my appreciation and thankful acknowledgments.

With these words, I again thank Your Highness for your kind presence here to-day and now beg you will be graciously pleased to declare this Exhibition open.

ECONOMIC NOTES.

AGRICULTURE.

Changing Methods of Stock Feeding.

"T. B. G." writes in the *Farmer of Stock Breeder* thus:—

The present times are changing old customs, and there is no doubt that amongst other changes which we shall have to adopt will be one in the method of feeding stock through the summer months. Up to the present time, with so large a proportion of our land under grass, we have been enabled to maintain our cattle stocks through the summer months on grass alone, simply giving a little supplementary concentrated ration to our dairy cows, feeding bullocks and young calves. In many cases even those named have received nothing but grass for the better part of the year. Now, however, with so much grass land brought under the plough, unless we reduce seriously our cattle stocks, some different system of maintaining them during the summer must of necessity be devised. We are being told by experts on all hands that much more stock can be maintained on arable land than grass, meaning, of course, by means of what is called the "soiling system," and without doubt we shall soon see a very great extension of that system in this country. It must come if we are to keep up our usual head of stock—grass will have to be supplemented by other green crops, which must, of course, be grown on the arable land. It is quite impossible to carry on under such Orders as at present exist, for farmers have in a great many instances been compelled to plough up all land under lucerne, sainfoin, and temporary leys, and in addition break up a large area of grass land. On the top of all this they are urged to produce more food!

TO MAINTAIN MAXIMUM HEAD OF STOCK.

If we are to maintain the maximum head of stock and produce the maximum amount of meat from a given acreage, then the arable land must be made to help the grass, and the grass land must come in at such seasons as the arable fails. Give the farmer freedom of cropping again, and he will make the most of his pasture and arable, but if he is to be dragooned, as he is being now, in the future, then our production of meat, corn, and milk will be less than ever. By comparison with continental countries our method of grazing stock through the summer out of doors may seem an extravagant one, but taking the conditions under which agriculture

has been carried on for many years, up to now it has been the only practical method of maintaining stock to make ends meet; but with increased prices and labour facilities it will be possible in the future to make much more use of arable land in maintaining both cattle and sheep during the usual grazing period.

The growth of forage crops on the arable land for milking cows is no new idea, and the system can very profitably be extended to feeding cattle as well. We have been accustomed to graze our pastures night and day, with the result that it has taken about three acres at least to keep a milking cow through the spring, summer, and autumn, and at least one acre of first-rate grass to feed a butlock. It is obvious that with the decreased acreage of pasture that either less cattle must be kept on the old system or the pastures must be rested in the day time, and resort had to the arable land for supplementary rations during that time. When cattle only run the pastures during the night instead of day and night then the usual head of stock can be maintained on half the given quantity of land, the rest being made up by green forage crops cut and carted to the animals in the yards during the day time.

THE SOILING SYSTEM.

The soiling system, so far as it has been adopted in this country up to now, has mainly been in dairy herds, but there is no reason why it should not be adopted in bullock feeding with equally satisfactory results. Feeding cattle in hot weather under the present grazing system often do little good out of doors in the day time. They stand under trees and hedge-rows pestered by flies, and often run half the flesh off their bones from the gadfly in hot, tundry weather, whereas if they were brought up into yards and fed on freshly cut succulent forage crops during the heat of the day, and then turned out to graze in the cool of the evening, their progress would be found to be far greater and the pastures would be better grazed, no grass spoiled along hedgerows and near trees, and an acre of good land would maintain two bullocks instead of one.

MORE MILK FROM GREEN FODDER.

As regards dairying, too, there is no question that the cows will milk far better and give richer milk when partially fed on freshly cut green forage than on grass alone. Restrictions on the growth of lucerne, sainfoin, and such like crops must go, and soon. There has been too much nonsense of that kind, and if the powers that be will take a trip round the country-side they will see hundreds of acres which will neither produce corn nor grass this year, nor will many farmers ever get their seed back. They have no forage crops to fall back on. To

carry out a proper system of "soiling" it is necessary to have a regular succession of green crops commencing with early spring and continued until late autumn for very early consumption, as by mid-April it is perhaps best to rely on mangels on some of the later soils, but on good soils rye provides a good early feed, and then lucerne and the clovers come in, and of all soiling crops lucerne is the most valuable whether for dairy cows or feeding cattle. With lucerne, or, in fact, any of the clovers, less concentrated food need be given. Vetches sown in relays will provide a quantity of useful food during May, June, and July, and then there is rye-grass, green maize, cabbages, and then turnips and swedes to come in autumn when the other green crops have finished their growth. There is, of course, the question of labour and expense, but a yardman may just as well go and cut a load or two of green forage daily for the stock as potter about doing odd jobs through the summer, and the manure made by the stock in the yards during the day time from spring till autumn will be a great asset in the growing of better corn crops.

MACHINERY ON THE FARM.

Mr. F. S. Courtney, Consulting Engineer to the R. A. S. E., recently read at the Royal Society of Arts an interesting paper on the above subject, from which we take the following:—

Dealing first with ploughs, Mr. Courtney said that to obtain a uniform unbroken furrow and reduce the draught, the length of breast has been increased with a more gradual incline; but now the tendency is to shorten the body of the plough and make the breasts approximate more to the digging breasts. When the two-furrow plough was first introduced it was claimed that "when two, three or more ploughs were combined they serve to steady each other;" and this point and the diminution of friction on the land side of the plough, he could endorse. The futility of drawing comparisons between ploughs, unless you have precisely similar conditions and soil, was emphasised by dynamometer diagrams taken with a three-furrow plough, one in light soil, the other in heavy. The first showed a mean draw-bar pull of 7 cwt., while in the second case a pull of 44 cwt. had to be averaged.

Steam ploughing resolved itself practically into four different systems:—(1) The double-engine system, with an engine at each end of the furrow, now too well known to require description; (2) the

single winding engine with travelling anchor on the opposite headland; (3) the round about system, in which a portable engine, by means of a flexible coupling, drove direct a double windlass, the ropes from which were guided by grooved pulleys at the corner of the space to be ploughed; (4) the high-speed roundabout rope system.

Of these, the double-engine system proved best. In the travelling anchor system the anchor involved difficulties and delays which were increased on soft ground. While the roundabout system appealed to many as specially applicable to small holdings, where the farmers already possessed of a portable engine; it entailed too much attention, especially in setting to work, and it took too long about its work. In the high-speed rope system, slackening and tightening of the rope with any change of weather was found to give trouble, while the plant involved very excessive attendance and wear and tear.

TRACTOR PLOUGHING.

Tractor haulage of ploughs by the engine was tried as early as 1865; but the compression on the land, due to the weight of the engine, led to this method being abandoned for the time. The advent of the light oil tractor, however, led to a modification of former views.

Motor tractors hauling ploughs leave an unduly wide headland, and their frequent passage along the headland sometimes tends to undue compression of the soil. This has led to the introduction of the self-contained motor-plough. Though with these the headland width is reduced, time is lost at turning at the end of each series of furrows. Actual observation shows that on a field 500 yards wide, with the plough travelling at $3\frac{1}{2}$ miles an hour, time thus lost amounts to over one-fifth of the whole, while with a shorter furrow this proportion is increased. Though a balance plough like that generally used with steam ploughing sets would involve extra cost, the saving in time which it might effect by obviating this turning might well repay the extra outlay.

On the vexed subject of tractor ploughing speed, it was pointed out that the answer at present lies with the plough. Existing patterns designed for slow speed will not hold in the ground at high speed, especially on gravelly or stony bottom.

As a labour saver the manure distributor was regarded by the author with doubt, partly on account of the time taken in loading. "It is quite an open question whether—provided there is a sufficiency of labour to distribute the manure by manual labour—a greater acreage per day cannot be effected without the aid of a distributor."....."A really efficient distributor for farmyard manure has yet

to be devised. So long as the manure is short and well rotted, distributors work admirably, but if they have to deal with longish straw, they choke."

REAPING MACHINES AND BINDERS.

Combined reapers and threshers have been used in America; but the objections in this country are:—(1) Weight. (2) Absolute uniformity in ripeness of crop cannot be assured. As ripening continues after the corn is cut, this matters little when the corn is allowed to remain in the sheaf; but to thresh it immediately would be to bruise the unripened corn. (3) Clover or seeds growing with the corn inevitably choke the machine, which would also get choked by the straw after a shower of rain. (4) On ridge and furrow land inclinations and levels of riddles, screens, etc., would continually vary and efficient separation be upset.

For collecting and loading hay a machine to take the place of hand labour is in demand. Doubtless small loaders similar to the larger rick elevators drawn behind the loading waggon will come into more general use in the immediate future.

With the coming of the low-powered tractor there is an increasing demand for smaller threshing machines.

SOURCES OF POWER.

There is a frequent neglect in this country to utilise small water powers. Wherever such were available advantage should be taken of them to drive an electric plant, which might not only suffice to light the farm buildings, but might supply power to the farm machinery.

It is worth recalling that while the portable engine of 1849 consumed 11½ lb. of coal for each brake horse power per hour, by 1887 the fuel consumption had been reduced to less than 1 9-10 lb. per brake horse power hours. Since then it has probably been improved but little.

WATER SUPPLY.

If a moderate fall is available, no more efficient method can be adopted for a moderate supply than a hydraulic ram, with a storage tank at sufficient elevation to command all buildings. If the water has to be pumped, and the locality is favourable, a wind engine may be useful, provided sufficient storage is available to carry through the longest possible windless periods. In some cases the cost of this is excessive, an oil engine and pump are at present generally found most convenient.

If water power is available, a small water wheel or turbine may be used for pumping; but if sufficient power is available, it is best to use it for generating electricity and driving pumps or other machinery requiring power by electric motor. Electricity lends itself so easily to convenient

distribution that, where possible, it should be used.

"I am quite sure, with the inevitable shortage of labour, if the agriculturist is to keep pace with his foreign competitors, there will be the necessity for a considerable increase in the use of machinery."

Professor Somerville, in referring to the work that had been done during the last twelve months in the country of Oxford, admitted that the task would have been much more difficult but for the tractor, which in the hands of a good workman had shown itself capable of doing marvellously good work. The same might be said, too, of the double-furrow plough with skim coulter. He suggested that the reason why some machines used in certain districts were not favoured in other localities might frequently be explained by difference in climate. A certain amount of exchange in this matter might be profitable. For instance, in Sussex he had employed an implement very popular in the North, but seldom, if ever, seen in the South. This was a turnip-cutting cart, which is nothing more than a Banbury cutter fitted to a cart, so that as the turnips are cut into fingers they can be dropped about the field. All his neighbours approved of it, but none adopted it.

Mr. Falconer suggested that one reason why the turnip-cutting cart was not used in the South lay in the fact that it was employed to cut turnips to sheep feeding on grass, which was not much done in the South.

Mr. Alfred Hicks deprecated the idea of local standardisation. What was wanted was investigation by some body like the Royal Agricultural Society to settle the best types of implements for any given district. At present he had innumerable patterns of ploughs, for example, to choose from. What he wanted to know was which were the best for his purposes. He believed that, generally speaking in each district six standard patterns would be quite sufficient. The speaker then alluded to the excessive weight of some implements, and instanced a very fine disc harrow that he had, which, however, was so heavy that he could not use it. It would pull three horses all to pieces for a fortnight. One great advantage of the tractor was that it did not consume the produce of the farm. He had seen that each house consumed to produce of five acres, and the statement had struck him as so astounding that he had taken the trouble to work it out, and found that it was a very good five acres that a horse would clear.

Mr. John Allean thought that the future would show the cable plough as best for very heavy land, and the tractor would come into use on lighter soils.

MAKING APPLES A PAYING CROP

There is, I am convinced, says a writer in the *American Agriculturist*, no money producing line connected with the farm from which the returns are so satisfactory and certain as that of a well-producing apple orchard. Yet as I pass about the country I find that altogether too many of the country people buy their winter's supply of apples, or go without them entirely. Not long since I visited a certain York state farm. This farm is considered modern in every respect; they have their milking machine, electric lights and a fine water system, and the manager and owner prides himself upon his ability to run the place at its highest efficiency; yet he is paying \$4 a barrel for apples. There is not an apple, pear, plum or cherry tree on the place, neither is there a grape-vine or a berry patch.

I asked him about this matter and his reply was: "Oh, I suppose this farm would produce as good apples or small fruit as could be found anywhere, but it takes such trees so long to come into bearing. I never seem to find the time to set an orchard out." Had he done this when he purchased the farm, some 12 years or so ago, he might have had an excellent orchard to-day, one bringing him in a goodly profit with little labor or expense aside from picking and marketing the fruit.

POINTS AS TO LOCATION.

To begin with, for my orchard I chose a sheltered and well-drained location. I found that practically all the heavy autumn winds were west winds, so for that reason I chose a plot of land which had a natural protection on the west. Had I not been able to find such a location on my farm which was naturally so protected I would have set out, along with the setting of my orchard, a row of some fast growing trees along the west side for a windbreak. However, find out first the nature of the prevailing autumn wind.

My orchard slopes toward the south and east. This might be a very good thing for one community and a very poor thing for another. My farm is located near a large lake, which keeps the air cold

well up into the spring; therefore my trees do not begin to bud, in spite of its slope to the south, until all danger of frost is passed. If I lived where spring frosts were prevalent I would prefer that my orchard slope to the north, thus the buds would not begin to open so soon.

My choice of varieties are Northern Spy, Greening, Baldwin and Spitzenburg, all well known and well liked. My young trees I purchased from a well-known nursery, and one which was located in a northern climate. A tree grown in a mild climate may do well when transferred to a cold climate, but I did not care to take the risk. These trees I set out in rows 45 feet each way. There is a great difference in opinion regarding the proper distance which should exist between apple trees.

If I were setting out a new orchard the trees would not be placed nearer than in the old orchard, and where one is not cramped for space they should be given even more room. More space means the orchard can be more easily cultivated, the fruit will color better and ripen earlier and the branches will develop with greater strength where they do not run in among one another. In making the holes I used powder blasts and I am satisfied that this is much better than the spade-dug hole for fruit growing. It loosens the dirt up for yards about the hole and thus gives the newly set tree a better chance.

MUCH SPRAYING THE THING

These young trees I sprayed once each year until they came into bearing, and from then until the present time I have always practised spraying twice each season, once just before the full bloom and again just as the blossom is falling and the fruit setting. From the very beginning I have always kept a close watch over my orchard for grubs, worm nests, scales and suckers, each of which is removed and destroyed just as soon as discovered.

As to pruning, I have always been rather free with the saw and knife. Experience has proved to me that more orchards are ruined by underpruning rather than overpruning. I go through my orchard each year and remove all dead and diseased branches. I also cut away where the branches have become so thick as to keep the sun out and thus prevent coloring of fruit. I do much of the pruning during the season when the sap is in the ground—if possible soon after they find freeze for winter.

Before beginning to gather the fruit I go through my orchard and look over each tree thoroughly to see if I can discover any weak branches or splitting crotches. If they are found I prop them securely and then just as soon as the fruit is picked I remove all danger of further breaking by bolting through them to the main part of the tree or to some larger

and stronger branch. Each autumn I scrape the scale-bark from the butt of each tree. A common hoe is an excellent implement for doing this. These scales make, when allowed to remain on the tree, a wonderfully fine winter home for worms and insects. They should be gathered up and burned after removing. In the spring I spray the butt of each tree with whitewash. Painting over with a whitewash brush is better than not to go over them at all, but a strong spray does the work best and reaches places which might otherwise go unsprayed.

I remove the ripened fruit from the trees just as soon as it has colored properly. It is very seldom that I find it advisable to pick all the fruit at one time. In some instances I have been over my orchard as many as six times before I found the last of the fruit to have a marketable color. My apples are packed and sold in the market as "A No. 1" and "B Grade." The former is the very best which the orchard will produce, perfect in size, color and shape. These are packed in half bushel crates and sold through a wholesale house. The other grade is packed in barrels and sold for the best price I can secure of the local apple buyer.

INDUSTRIES AND COMMERCE.

Commercial and Industrial Policy after the War.

The following is from the *Board of Trade Journal* :—

In July, 1916, the Prime Minister of the day (Mr. Asquith) appointed a Committee, of which Lord Balfour of Burleigh was the Chairman, with the following terms of reference :—

To consider the commercial and industrial policy to be adopted after the War, with special reference to the conclusions reached at the Economic Conference of the Allies and to the following questions :—

(a) What industries are essential to the future safety of the nation : and what steps should be taken to maintain or establish them.

(b) What step should be taken to recover home and foreign trade lost during the War, and to secure new markets.

(c) To what extent and by what means the resources of the Empire should, and can be developed.

(d) To what extent and by what means the sources of supply within the Empire can be prevented from falling under foreign control.

The Committee have published their report and the conclusions embodied in it are set forth in a

series of chapters, of which Chapter XXI contains a summary, as follows :—

BRITISH TRADE AND INDUSTRY IN 1918.

In this chapter we take as our starting point a survey of the general position of British industry and Overseas trade in 1913, the last complete year of peace, based especially upon the reports of the Board of Trade Committees upon our chief staple industries.

From that survey we draw certain broad conclusions as to the condition of British industry and trade and the competition to which it was exposed immediately before the war. We find that in long-established manufactures, with the important exception of the iron and steel trades, British industry had shown in the decade preceding the war great vitality and power of extension, but that in the rise and expansion of the more modern branches of industrial production the United Kingdom has taken only a limited share. Certain branches of production, of great importance as a basis for other manufactures, had come to be entirely or very largely under German control, and in numerous branches of industry, outside the great staple trades, foreign competition had become increasingly acute, and foreign manufactures had secured a strong or even predominant position. In Overseas trade British merchants and manufacturers were encountering energetic and successful competition, which is ascribed to a variety of causes, including the adoption by foreign merchants and manufacturers of methods of organization and distribution different from, and in some cases markedly more effective than, those hitherto pursued by British traders.

Owing to the abnormal conditions due to the war, whilst an amount of foreign trade very large in value has been maintained, its character and directions have been altered in many reports. We think that war requirements have enormously increased our productive capacity in certain great branches of industry, notably the Steel and Chemical Industries, and that in the numerous directions British manufacturers have shown much adaptability and resourcefulness, and the knowledge and experience gained during the war should be a most valuable asset in respect of our post-war trade. We urge the vital importance of every effort on the part of both employers and employed to attain the largest possible volume to production in order to secure the speedy recovery of our industrial and financial position.

We state that we have not felt it possible to examine in detail all the specific recommendations of the Board of Trade Committees, which so far as action has not already been taken by the

Government, should receive full and sympathetic consideration, but that we think the course most likely to be useful is that we should confine our attention to the large questions of commercial policy.

MEASURES TO BE ADOPTED DURING THE TRANSITIONAL PERIOD.

We re-affirm the main recommendations embodied in our First and Second Interim Reports, *viz* :—

(a) The present regime, hereby importance of goods of enemy origin is prohibited, should be continued, subject to license in exceptional cases, for a period of at least twelve months after the conclusion of the War, and subsequently for such further period as His Majesty's Government may deem expedient.

(b) The Pairs Resolutions relating to the supply of the Allies for the restoration of their industries can be carried into effect if a policy of joint control of certain important commodities can be agreed upon between the British Empire and the Allies. Any measures should aim at securing to the British Empire and the Allied countries priority for their requirements and should be applied only to materials which are mainly derived from those countries and will be required by them. This policy should be applied as regards the United Kingdom by legislation empowering the Government to prohibit the export except under license of such articles as may be deemed expedient, and as regards the British Empire and Allied countries the Government should without delay, enter into negotiations with the various Governments concerned, with a view to the adoption of suitable joint measures in the case of selected commodities of importance.

(c) We recommend that the Government should consider, in consultation with the Allies, the expediency of establishing after the War a joint organisation on the lines of the Commission Internationale de Ravitaillement for dealing with the Allied Governments for reconstruction purposes, and with such private orders as they may find it expedient to centralise.

(d) We point out that the prolongation of the War and the entry into it of the United States have increased the importance of a considered policy directed towards assuring to the British Empire and the Allies adequate supplies of essential raw materials during the period immediately following the conclusion of peace, and that the extent to which the Paris Resolutions which bear upon this vital question can be carried into effect depends upon the co-operation of the Governments concerned.

We recognise that in addition to the foregoing proposals it will be necessary to continue for some period after the war some portion of the control of

home and foreign trade imposed during the war in order particularly to secure to the country adequate supplies of foodstuffs and raw materials for industry and their fair distribution. But we recommend that the restrictive measures which it may be necessary to continue should be kept within the narrowest possible limits and, wherever practicable, the trades concerned should be entrusted with the working of the control under Government authority. The policy of the Government should be directed towards the restoration of normal industrial conditions within the shortest possible time. We are strongly of opinion that State control of and restrictions upon industry arising out of war conditions will be found to be detrimental under normal conditions and should be removed as soon as possible after the conclusion of peace, due regard being had to the circumstances of each particular case.

INDUSTRIAL AND COMMERCIAL ORGANIZATION.

The following are further recommendations of the Committee appointed in July 1916, under the presidency of Lord Balfour of Burleigh to consider the commercial and industrial policy after the war :—

We point out that, notwithstanding the strength of the United Kingdom's economic position, there is a widespread feeling that a reconsideration of our industrial and trade organization has become necessary in consequence of the increasing intensity of foreign competition based largely upon a system of combination in respect of production and distribution which has hitherto made comparatively little progress in the United Kingdom. While there is a danger that consolidation and combination may not only tend to diminish that individual initiative and enterprise to which the progress of British manufacture and industry has been largely due, but may also be carried to a point at which it becomes inimical to the general interests of the country, we agree generally with the opinion that in some important directions the individualistic methods hitherto mainly adopted should be supplemented or entirely replaced by co-operation and co-ordination in respect of (1) the securing of supplies of materials; (2) production (in which we include standardization and scientific and industrial research), and (3) marketing.

As regards associations for general trades purposes, it is, in our opinion, very desirable that in all important British industries there should exist strong, comprehensive and well organized associations which should be clearing houses of information

of common interest, and should be competent to voice the opinions and needs of their respective trades as a whole.

As regards combinations for the regulation of trade we describe briefly the forms which these have taken in the United Kingdom, and the extent to which they have been carried, and we point out that their development in the United Kingdom during the two decades preceeding the war was far surpassed by the corresponding movements in the United States and Germany, which in the former case have been chiefly in the direction of actual consolidations, and in the latter case have taken the form of terminable combines or "cartels."

We are of opinion that every encouragement should be given by the Government to the formation of combinations of manufacturers and others concerned to secure supplies of materials, and that, where it appears expedient that the control of mineral deposits in foreign countries should be obtained all practicable support should be given.

In regard to production, we think that the constructive action must come from the industries themselves, and we hope that the development may be assisted by the policy of the Department of Scientific and Industrial Research, to which we refer, by co-operation amongst manufacturers in respect of munitions and other military and naval supplies, and by combination in respect of marketing. In order to facilitate the necessary organization of many industries on a larger scale than has been the case in past years, we recommend that an authority should be set up which should have the right, after inquiry, to grant compulsory powers for the acquisition of land for industrial purposes and the diversion or abolition of roads or footpaths. We also recommend that there should be a judicial body with compulsory powers to deal with the question of wayleaves required for the development of mineral royalties and the economical working of collieries and mines.

We recognize that the formation of organizations for marketing in respect of Overseas trade will stimulate the creation of combinations for the control of domestic sales. We believe, however, that such development is not only desirable in some cases, but practically inevitable under modern conditions and that the attitude of public opinion, of local authorities and the State, which has hitherto been antagonistic, must be modified. We consider, moreover, that so far from being adverse to the interests of labour combinations of employers are on the whole beneficial to the workers in the trade affected in respect of rates of wages, steadiness of employment and other matters.

We think that it would be inexpedient for the Government to enter upon any policy aiming at positive control of combinations in this country, but that it is desirable that some means should be devised for securing to a responsible Government Department adequate information as to the formation of combinations, and that provision should be made for State investigation in special cases. At the same time we think that combinations should, where necessary, be legalized so as to be enforceable between members.

CHINESE WOOD-OIL INDUSTRY.

One on the most important of Chinese products—and one for which Hankow acts as chief exporting centre—is t'ung-yu, or wood-oil, and the following interesting details of the industry are from a report by the United States Vice-Consul at Hankow:—

Wood-oil is obtained from two varieties of *Aleurites*, a small genus of the *spurge* family. Each variety has rather sharply defined boundaries—the mu-yu shu, or wood-oil tree being found for the most part in the southern provinces, while the t'ung-yu shu, literally tung-oil tree, is confined mainly to Central and Western China. By chemical analysis the oils of these two trees are found to be practically the same, but the t'ung-yu shu is of far more importance because of its greater hardihood and wider distribution. Fully nine-tenths of the so-called wood-oil exported from China is made from this variety.

The mu-yu is generally found in the Province of Kwangsi, near the city of Wuchow, which also acts as its chief market. Some of the oil is shipped to Hong-Kong, but trade is not large.

The Yangtze Valley, in its upper reaches, is the territory in which the t'ung-yu tree flourishes most freely. The hilly country found in the gorge region, and, in fact, all the land from Ichang westward to Chungking, is particularly adapted for its growth. The plant is most often found on rocky hillsides, thriving on the poorest of soil so long as the annual rainfall is not less than 29 in. and the altitude not greater than 25,000 ft. The tree seldom exceeds 25 ft. in height, is rather ornamental, and has a great profusion of blooms in April. The fruit is about the size of a small orange, and contains three to five seeds not unlike shelled Brazil nuts in shape, although resembling more nearly the hickory nut in size.

The nuts are always gathered before maturity. As they are covered with a husk they are either

parched in iron pans or sieves over a fire, or else covered with straw or grass, under which fermentation takes place in the thin fleshy part of the fruit, thus allowing the nuts to be easily removed.

The methods employed for extracting the oil, although crude, are effective. After the seeds are removed from the husks they are placed in a circular stone trough, where they are crushed by a stone roller drawn by a buffalo, cow, or ass. The pulverised meal is partially roasted in shallow pans, then steamed over boiling water, the product meantime being placed in wooden vats fitted with wicker bottoms. The nuts are next placed in steel frames with straw as an outside container. The frames are arranged on edge in a press and pressure is applied. This is usually accomplished by means of a system of wedges which are driven in one after another by means of a huge battering-ram until the brown, watery, and odoriferous oil is crushed out into the vat below. As a rule the oil is then slightly heated and strained through a coarse grass cloth. (If the heating process is carried too far the oil becomes dark brown instead of retaining its desired light yellow colour.) The product is then placed in wicker baskets lined with varnished paper, and is ready for shipment. As a rule, the oil yield is about 40 per cent of the original weight of the kernels. The refuse matter, which is in the form of cakes, is used as a fertiliser.

In the vicinity of Hankow the native dealers allow the oil again to precipitate, drawing off the clear liquid and selling it to the foreign exporting firms. The residue is then sold to small dealers in Wuchang and Hanyang, who once more skim the oil after a further precipitation process. The oil is then sold to the native boatmen for use on their craft.

About the only variation in the above method of oil extraction is that in cold weather, when the oil congeals to a grease stage, it is necessary to heat the mass slightly in order to allow precipitation to take place. This is usually accomplished by steam coils being placed within the containing tank. Under this treatment the product soon liquifies, the foreign matter drops to the bottom, and the clear liquid is drained off through stopcocks placed just high enough to avoid the thick, muddy sediment at the bottom.

T'ung-ye is widely used throughout China as a paint oil for outsidings purposes. It is reported that as a drying oil it excels even linseed oil. One of its greatest local markets is found among the native boatmen, who never paint their boats but coat them with the cruder grades of wood-oil which not only gives the woodwork a bright, lustrous finish but also acts as an excellent preservative. When

certain mineral substances known as t'utzu and t'o-shen are added to the wood-oil and the resulting mass is heated for about two hours, a varnish called kuang-yu is produced, which is valuable as a water-proofing substance when placed on silks, pongees, and similar articles.

T'ung-yu is also used as an adulterant in the manufacture of lacquer varnish, as an illuminant, and as an ingredient in concrete, and when mixed with lime and bamboo shavings it is used by the natives in caulking their boats. The so-called Chinese or Indian ink is made from the soot resulting from the burning of the oil or the fruit husks. The product is also used as a dressing for leather, in the manufacture of soap, and as a varnish for fine furniture. It is chiefly used in foreign countries for the manufacture of varnish from cheap gums. Other oils require a higher and more expensive quality of gum in order that the resulting varnish be of equal grade. This feature, together with the rapidity with which wood-oil varnish dries, has caused the demand for the product steadily to increase.

The growing importance of wood-oil has led countries other than China to look into the possibilities for the culture of the tree within their own domains. The United States in particular has made rather extensive investigations along these lines, and it is reported that soil and climatic condition in some of the southern States are such as to permit of the tree's growth and cultivation. Certain it is that the product is of sufficient importance to warrant consumers in carefully investigating its future possibilities.

The quality of the 1916 output of wood-oil was below average. This condition was due in large measure to the fact that adulteration to a greater or less extent was practised by the native producers during the entire year. Especially was this so during the period of high market values. As a rule, tallow seed and peanut oils are the adulterants used, although sesame, rape, and poppy-seed oils are also utilised when their market values are not prohibitive.

The fruit of the t'ung-yu shu, from which wood-oil is made, usually matures about the middle of October, but last year rains prevented the gathering of the crop until nearly a month later.

Practically the entire output of wood-oil is produced in the provinces of Szechwan, Kweichow, Hunan, and Northern Hupeh, their percentages of output in the order named being 35, 25, 25, and 15. Hankow is the chief exporting centre, shipping, in 1915, 34,246 tons of oil, valued at 5,748,490 taels (about £730,000), or over 90 per cent of the export for the whole of China. Wuchow is the only other exporting centre of any importance, but it in no way

rivals Hankow, as its total shipment during 1915 was but 1,880 tons, valued at 315767 taels (about £40,000). The following table shows China's

shipments of wood-oil to foreign countries during the years 1912-15:—

Exported to	1912.	1913.	1914.	1915.
	Tons.	Tons.	Tons.	Tons.
United States (including Hawaii).	18,328	18,526	15,832	12,852
European countries.	13,018	7,311	8,036	3,040
Other foreign countries.	3,343	1,761	2,296	2,580
Totals	34,689	27,598	26,164	18,472

China's output of wood-oil has decreased over 45 per cent during the four years 1912-15, whereas the demand, especially in the United States, has been steadily growing. It is believed, by those most closely in touch with market conditions, that upon the resumption of normal conditions in China and in Europe the trade in this product will reach unprecedented levels.

JAPAN'S INDUSTRIAL DEVELOPMENT.

One of the most noteworthy features in the commercial history of the last three years, says a correspondent in the Commercial Supplement of the *Times*, has been the rise of Japan as an industrial nation. The first effect of the war on trade was to oust Germany and Austria from the world's markets; then the conquest of Belgium put that country out of the running; and, later on, as the struggle made greater and ever greater demands on the industrial resources of the Allies, France, and even the United Kingdom, found themselves unable to satisfy the demands of the Overseas markets for all classes of goods. The result has been that those nations which have been able to turn their full attention to industrial pursuits have increased their foreign trade by leaps and bounds, and one of the outstanding examples of this is Japan.

In 1913 Japan's exports were valued at £64,264,000; by 1915 this figure had increased to £71,453,000; and in 1916 to £114,000,000, an increase in three years of 77 per cent. Moreover, the improvement is still going on, for in the first six months of last year the exports were valued at £71,373,000. Presuming that during the remainder of the year trade continued at the same rate—and with America definitely engaged in the war Japan may reap a still

greater harvest—the figure for 1917 will be something like £140,000,000, or more than double that of the last pre-war year.

Of course, a certain proportion of this enormous increase is accounted for by inflated prices but higher prices do not account for the whole of the increase, as will be seen later. The fact is that Japan has recognised her opportunity for industrial and commercial expansion, and has seized it. The Japanese are clever, energetic, resourceful people, with a special genius for learning from the example of other nations. With an abundance of cheap labour and cheap power derived from the many waterfalls of the country, and helped by the absence of low-priced German goods from the market, Japanese manufacturers have been able to turn out in certain lines goods which, at the price at which they are sold, will probably be able to compete with any the world can produce.

That the Japanese manufacturers believe in themselves is shown by a recent announcement in the native press that the Tokio Gas and Electrical Company, which, besides its ordinary manufactures, is already engaged in the manufacture of incandescent mantles, galvanised iron and enamelled ware, is now increasing its capital from one to three million yen (£102,000 to £306,000.) The new capital is to be employed in the manufacture of motor-cars, industrial tools and firearms.

Nor is the manufacturer left entirely to his own unaided efforts. The Japanese Government is fully alive to the advantages of being independent of foreign supplies, and is assisting in a variety of ways in encouraging the establishment of new industries in the country. For example, to render Japan independent of German dyes and chemicals the Government is giving direct subsidies to factories making dyes and certain other chemical products. To encourage interest in the iron industry it has been decided to grant immunity from taxation of all descriptions for a period of ten years to persons undertaking the erection of iron foundries, and also to permit the importation of the necessary ores and plant duty free. Other industries are assisted by granting drawbacks, when the products are exported, on some of the imported raw materials used in their manufacture, whilst by a system of shipping subsidies export trade in general is helped by ensuring that goods can be shipped to various markets at reasonable rates.

THE INDIAN INDUSTRIAL COMMISSION.

Its Report Summarised.

The following official summary of the Indian Industrial Commission has been forwarded to us for publication :—

The Report of the Industrial Commission, which has been sitting for the last two years under the Chairmanship of Sir Thomas Holland, K.C.S.I., has been issued and copies can be obtained in a convenient octavo form at the price of one rupee. Before summarising the Report it is important to note that the constructive proposals depend on the acceptance of two principles:—(1) that in future Government must play an active part in the industrial development of the country, with the aim of making India more self-contained in respect of men and material, and (2) that it is impossible for Government to undertake that part, unless provided with adequate administrative equipment and fore-armed with reliable scientific and technical advice.

With these principles in mind, it will be convenient first to glance at the administrative machinery which the Commission proposes and then to examine the work which it is intended to do. The administrative proposals include the creation of imperial and provincial departments of Industries and of an Imperial Industrial Service. The imperial department would be in charge of a member of the Viceroy's Executive Council, assisted by a Board of three members entitled the Indian Industries Board, and be responsible for the industrial policy of Government and the inauguration and carrying out of a uniform programme of industrial development throughout the country. The actual administrative work would be almost entirely decentralised and would devolve on Local Governments. The performance of these duties would necessitate the employment of a large staff of officers whose qualifications would primarily depend upon a knowledge of mechanical engineering; and the formation of an Imperial Industrial Service is suggested in order to safeguard Government against the dangers and difficulties of casual recruiting. This service would consist mainly of mechanical engineers and engineering technologists, the majority of whom would be employed under the Local Governments. The head-quarters of the Department and of the Board should be with the Government of India.

The provincial department would be administered by Directors of Industries, assisted by specialists

and technical advisers who would usually be seconded from imperial services for work under the Local Government. A provincial Director would thus be able to develop the industries of his province with the help of competent engineers and scientists. He would be advised by a provincial Board of Industries, composed mainly of non-officials; and he should hold the post of a Secretary to Government to secure expeditious and effective despatch of work.

It now remains to consider the work which this organization is to carry out and the conditions of India which render essential a policy of active intervention on the part of Government in the industrial affairs of the country. The first chapters of the Report deal with India as an industrial country, her present position and her potentialities. They show how little the march of modern industry has affected the great bulk of the Indian population, which remains engrossed in agriculture, winning a bare subsistence from the soil by antiquated methods of cultivation. Such changes as have been wrought in rural areas are the effects of economic rather than of industrial evolution. In certain centres the progress of western industrial methods is discernible; and a number of these are described in order to present a picture of the conditions under which industries are carried on, attention being drawn to the shortage and to the general inefficiency of Indian labour and to the lack of an indigenous supervising agency. Proposals are made for the better exploitation of the forests and fisheries. In discussing the industrial deficiencies of India, the Report shows how unequal the development of our industrial system has been. Money has been invested in commerce rather than industries, and only those industries have been taken up which appeared to offer safe and easy profits. Previous to the war, too ready reliance was placed on imports from overseas, and this habit was fostered by the Government practice of purchasing stores in England. India produces nearly all the raw materials necessary for the requirements of a modern community; but is unable to manufacture many of the articles and materials essential alike in times of peace and war. For instance, her great textile industries are dependent upon supplies of imported machinery and would have to shut down if command of the seas were lost. It is vital, therefore, for Government to ensure the establishment in India of those industries whose absence exposes us to grave danger in event of war. The Report advocates the introduction of modern methods of agriculture, and in particular of labour-saving machinery. Greater efficiency in cultivation, and in preparing produce for the market would follow, labour now wastefully employed would be set free for industries, and the establishment of

shops for the manufacture and repair of machinery would lead to the growth of a huge engineering industry. After examining the resources for generating power, the Report says the coal of India is generally of a poor quality and the radius within which it can be economically used is accordingly limited. Moreover, the extension of metallurgical industries already started involves a severe attack on our visible supplies of coking coal. The Commission recommends a special survey of the coal position in India. The oil fields of Burma are being rapidly drained and no others of equal value have been proved. Wind power is too intermittent for industrial use. Attention should be directed to more economical methods of using wood fuel, and new materials for industrial alcohol should be investigated. The harnessing of water-power appears, however, to afford a more reliable source of energy, especially with a view to the development of thermo-electric industries; and Government is urgently enjoined to undertake a hydrographic survey in order to determine the places which offer possibilities for the establishment of hydro-electric installations.

The next chapters deal with "The Indian in Industries." They discuss measures designed to improve the efficiency of the Indian artisan and to encourage the educated Indian to take part in industrial enterprise. It is shown that the relative lowness of wages paid to Indian labour is counterbalanced by the comparative inefficiency of the individual Indian workman. The Commission assigns three causes for this inefficiency, *viz.*, the absence of education, the prevailing low standard of comfort and the effects of preventible disease. The Commission expresses itself in favour of universal primary education, but considers that it would be unfair and unjust to impose upon employers this duty, which devolves rather upon the State and local authorities. But education of a technical kind is also required, and the method of instruction to be followed will vary for workers in organized and for workers in cottage industries, the latter of whom, it may be remarked, considerably exceed the former in numbers. For cottage industries the Commission proposes an efficient system of education in industrial schools administered by head-masters with practical knowledge of the industries taught, and controlled by the Departments of Industries. The extension of marketing facilities must go hand in hand with the teaching of improved processes. In the case of organized industries mechanical engineering is taken as a typical instance, and the proposals include the establishment of a system of organized apprenticeship for a period of four or five years, with practical training in the workshops and theoretical instruction in attached teaching institutions.

The Commission places better housing in the forefront of its recommendations to raise the standard of comfort of the Indian artisan. Subject to certain safeguards, Government should use its powers under the Land Acquisition Act to acquire sites for industrial dwellings, and land so acquired should be leased to employers on easy terms. Special remedies are proposed in the case of Bombay, where the problems of congestion are unique. General measures of welfare work among factory employes are also suggested, and special attention should be paid to the improvement of public health. The elimination of such diseases as hookworm and malaria, which are prevalent almost everywhere in India, would add enormously to the productive capacity of the Indian labourer.

The general aversion from industrial pursuits of the educated Indian is ascribed to hereditary predisposition accentuated by an unpractical system of education. A complete revolution in the existing methods of training is proposed. For manipulative industries, such as mechanical engineering, an apprenticeship system, similar to that suggested for artisans should be adopted. The youth who aspires to become a foreman or an engineer, must learn to take off his coat at the start and should serve a term of apprenticeship in the workshop, supplemented by courses of theoretical instruction. At the conclusion of this period of training he may be allowed to specialise in particular subjects. For non-manipulative or operative industries, on the other hand, the teaching institution should be the main training ground, though practical experience is also necessary. Special proposals are made for commercial and mining education; and the future establishment of two imperial colleges is adumbrated, one for the highest grade of engineering and the other for metallurgy. To ensure the maintenance of close relations between the training institutions and the world of industry, the general control of technical education should be transferred to the Department of Industries.

The remaining chapters of the Report deal more specifically with Government intervention in industries. Government clung long to the tradition of *laissez faire* in industrial matters; but when in recent years it attempted to play a more active part in industrial development, its efforts were rendered futile by the absence of scientific and technical advice to assist it in estimating the value of industrial propositions and by the lack of any suitable agency to carry out approved proposals. To remedy the first of these defects, a reorganization of the existing scientific service is advocated, in such a way as to unite in imperial services, classified according to science subjects, all the

Scattered workers now engaged in the provinces on isolated tasks. Rules are suggested to govern the relations between the members of these services and private industrialists seeking advice. The situation of research institutes and the conditions and terms of employment of these services are questions for the decision of which the Commission considers that the appointment of a special Committee is necessary.

The administrative machinery with which Government must be equipped and some of the functions which that machinery will enable it to perform have already been described; but there are many other directions in which the development of industries can be stimulated. Useful and up-to-date information on commercial and industrial matters is essential both for Government and for private merchants and industrialists. A scheme is propounded for collecting such information and for making it available to the public through officers of the Department of Industries. The purchase of Government stores in the past has been conducted in such a way as to handicap Indian manufacturers in competing for orders and to retard industrial development in India. The Commission proposes that the Department of Industries should be in charge of this work and that orders should not be placed with the Stores Department of the India Office until the manufacturing capabilities of India have first been exhausted. A chapter is concerned with the law of land acquisition and enunciates principles in accordance with which Government might compulsorily acquire sites for industrial undertakings; in another, the various methods by which Government might render direct technical aid to industries are explained. The Commission considers that ordinarily Government itself should undertake manufacturing operations only for the production of lethal munitions. The administration of the Boiler Acts, the Mining Rules and the Electricity Act, the employment of jail labour, the prevention of adulteration, patents, and the registration of business names, of trade marks and of partnerships, are matters which are specifically dealt with. In the opinion of the Commission the compulsory registration of partnerships is practicable, and the question should be examined by Government with a view to legislation.

Industrial co-operation is discussed with reference to small and cottage industries; and the vexed question of the effects of railway rates on industries is considered. The Commission thinks that reduced rates to and from ports have been prejudicial to industrial development and that the position requires careful examination with a view to the removal of existing anomalies. In particular it should be

possible to increase the rates on raw produce for export and on imports other than machinery and stores for industrial use. The addition of a commercial member to the Railway Board and the better representation of commercial and industrial interests at the Railway Conference would help to secure a more equitable system of rating. The improvement of waterways and the formation of a Waterways Trust at Calcutta are also proposed.

The Commission lays emphasis on the disorganization of Indian capital and its shyness in coming forward for industrial development. There is no lack of money in the country, yet the industrialist cannot obtain the use of it except on terms so exorbitant as to devour a large part of his profits. There is a crying necessity for the extension of banking facilities in the mofussil. The Commission is disposed to favour the establishment of an industrial bank or banks; but it considers that the appointment of an expert committee is necessary to deal with this subject and asks Government to take action at an early date. As an 'interim' measure, a scheme is propounded for the provision of current finance to middle-class industrialists, by which the banks would open cash credits in favour of applicants approved by the Government of Industries on the guarantee of Government. Various other methods of financial assistance by Government are suggested, in particular the provision of plant for small and cottage industries on the hire-purchase system.

To sum up, the Commission finds that India is a country rich in raw materials and in industrial possibilities, but poor in manufacturing accomplishment. The deficiencies in her industrial system are such as to render her liable to foreign penetration in time of peace and to serious dangers in time of war. Her labour is inefficient, but for this reason capable of vast improvement. She relies almost entirely on foreign sources for foremen and supervisors; and her *intelligentsia* have yet to develop a right tradition of industrialism. Her stores of money lie inert and idle. The necessity of securing the economic safety of the country and the inability of the people to secure it without that co-operation and stimulation of Government impose, therefore, on Government a policy of energetic intervention in industrial affairs; and to discharge the multifarious activities which this policy demands, Government must be provided with a suitable industrial equipment in the form of imperial and provincial departments of Industries.

The recurring cost of the proposals is estimated at Rs. 86 lakhs; they involve a capital expenditure of Rs. 150 lakhs, mainly on educational institution, and a further capital outlay of Rs. 66 lakhs is anticipated for future developments. The Commission considers that this expenditure may be worked up to at the end of a period of 7 years.

MYSORE ECONOMIC CONFERENCE.

AGRICULTURAL COMMITTEE.

Work done in September, 1918.

Indigo Manufacture.—The scope for indigo production on a large scale is being investigated.

Dairy Farms.—Stock was taken of the progress made so far in dairy farming under the concessions sanctioned by Government. Results have not been satisfactory and the Committee are investigating the causes of failure. They have recommended the grant of a loan of Rs. 3,000 to Mr. V. T. Venkatachellam of Dodballapur who proposes to carry on dairying on scientific lines under the supervision of his son who is a graduate of the Coimbatore Agricultural College.

Fruit Culture.—Arrangements have been made to start an experimental fruit garden on the Bababudans with a view to ascertain the exotic varieties which can be grown on the hills and in the malnad. Orders are being booked for fruit plants, and the Committee's nurserymen are attending to them.

The rules relating to the grant of loans for fruit cultivation were examined in the light of the experience so far gained and certain modifications were proposed with a view to popularise the scheme by facilitating speedy disposal of applications.

Agricultural Experiments and Demonstrations.—The Committee feel that there is necessity for the establishment at suitable places of experimental stations dealing with all the more important crops grown in the State, as soon as the Department can command staff enough to do this work in an efficient manner. They also think that peripatetic demonstrations as at present organized by the Department on the ryots' holdings are likely to be of greater interest and benefit to the public than demonstration farms at Taluk or District Headquarters.

Live-stock.—There are in the Sheep Farm 91 sheep and 14 lambs. The lambs were dropped during the last two months and include fine specimens of high class cross breeding.

The investigation of Mr. Mirza Mohamed Mehdi into the conditions of pony breeding in the taluks of Kankanhalli, Kolar, Gundlupet, Hassan, Tumkur and Challakere disclose a deplorable state of neglect which, if unchecked, will probably lead to the early disappearance of this class of stock. The Committee have, in the light of the facts ascertained by him, proposed certain modifications of the rules sanctioned by Government for the encouragement of live-stock farms.

Statistics.—Statistical forms have been prepared for the collection of information regarding important crops with a view to study the development from year to year. The standard figures for the whole State have been prepared and are under scrutiny.

Water Hyacinth.—The Government of India called attention to the danger to be apprehended from the spread of this formidable pest, and in view of the special menace it constituted to our irrigational and other works of public utility, it was resolved to get a Kannada leaflet printed and to furnish 5,000 copies to the Irrigation Department for circulation with a coloured illustration.

N. RAMA RAO,
Secretary.

PROGRESS IN THE DISTRICTS.

Chitaldrug.

EDUCATION.

Reading Rooms.—Reading rooms were started at Kakkaragola, Doddabathi, Avergola, Kundavada, Syabanur, Karoor, Bhavitalu, Naraganahally and Malalkere.

Scholarships to Panchama Students.—Fourteen gentlemen promised to contribute monthly a sum of Rs. 113-12-0 for awarding scholarships to 900 panchama students at the rate of annas two each.

Admission of Panchama Students.—Ten panchama students were newly admitted to the Panchama School at Harihar.

INDUSTRIES AND COMMERCE.

An Iron Smelting Foundry.—An iron smelting foundry was opened at Maremmanahally in the Molakalmuru Taluk.

Starting of a Hotel.—A Hotel was started at Molakalmuru.

Shimoga.

EDUCATION.

Starting of New Schools.—Schools have been opened for boys at Konantale, Talagunda, and at Timlapur, and for girls at Arakere, Sakunavalli, and Gama.

Hindi Night Schools.—Two Hindi night schools were started in the Shimoga Taluk.

Reading Rooms and Libraries.—A reading room has been started at Choradi. Contributions of Rs. 62-8-0 and Rs. 45 have been collected towards the libraries at Ulavi and Kuruvalli respectively.

School Building Fund.—A contribution of Rs. 150 has been collected for the construction of a village school building at Bidare.

Panchama Boarding Home.—The Committee resolved to send a recommendation to start a Panchama Boarding Home at Shimoga on the model now sanctioned for the Panchama Boarding Home at Tumkur.

INDUSTRIES AND COMMERCE.

Opening of a Hotel at Jog.—It was resolved that a recommendation be made to the Industries and Commerce Committee for sanctioning Rs. 250 per season as an encouragement towards the opening of a decent hotel at Jog, on condition that the hotel should be conducted on the lines and tariff approved by the District Committee.

CORRESPONDENCE.

To
The Editor,
Mysore Economic Journal, Bangalore.

Agricultural Stock.

Sir,—Improvement of Agricultural stock means to improve the cattle breeding.

To do that a ryot must have sufficient number of cattle and sheep, say from 20 to 40 at least.

To maintain them he must have sufficient quantity of fodder.

The fodder that he grows is not sufficient for maintaining his cattle. What little he grows he tries to sell it because there is a high demand and price for it, not knowing that he wanted it for his own cattle.

The so-called gomal lands are either poor or quite ill-suited. In fact, all the villages have no gomal lands at all.

Almost all the culturable lands have been marked out and assessed fully by the Revenue Survey Department. These are sold or allotted to villagers on Hulbanni system. The Hulbanni Revenue is really a small item. There are some culturable fully assessed lands never brought on cultivation beyond showing them in Akarband.

Any land that may contain some trees would be taken up by the Forest Department to make up their Revenue on grazing ones or as *Bal Terige*.

Any good land on which good grass is grown is taken up by the Amrit Mahal Department.

Added to the above difficulties the uncertainty of yearly rainfalls are unusual and untimely so that the ryot is not sure of the ripe growth of the crops raised by him on his land though it fills up the average quantity for Government reports.

To avoid the above troubles to some extent it would be essential if the Government were to introduce and renew the "*Hulgaval Kandayam System*" which existed in previous times and prior to the introduction of the Revenue Settlement, and compel each ryot to have such grass lands at least an acre for every six acres of dry and two acres of wet lands. He must be allowed to reserve such for grazing purposes only, as is done by some ryots in Nagamangala and other taluks. Rather rarely of late and he should not be allowed to cultivate it without permission. He can till the land, grow good Hariyali grass as Mr. Hollister does in Kolar town. As the number of cattle increases, he may be allowed more such grasslands. This will be a tenure to

be re-opened in the State. Personally many ryots would take it a great boon if such tenure is renewed now.

Silos are very good. I have myself tried some years ago, while I was in service, in the Bangalore District at the suggestion of the late Cols. A. C. Hay and a Macintire. The grass so preserved in silos are very well nourished by horses and cattle—even with a smaller quantity. But the difficulty is to get a good supply of grass which can only be expected from timely rains and Baujar Kharab lands.

The Taluk Amildar must be empowered to rent out such grass lands from Kharab lands at a nominal rate of assessment of four annas per acre according to the local circumstances of the soil and the situation of the village,

C. KRISHNA RAO,
Asst. Commissioner (Retd.)

Rural Economic Studies.

Sir,—The following is a brief report of agricultural investigations made near Mysore by me.

My first task was to select certain villages near Mysore generally which might serve as typical instances, a study and examination of which would give certain information which can well be attributed to the general agricultural condition of almost all the rural districts, which are watered by the Cauvery river near Mysore. With this object in view, I chose a few villages which are irrigated by the river *Cauvery*, such as *Bommur* village in the *Seringapatam* Taluk, and *Indwal* village in the *T. Narasipur* Taluk. This latter village is partly irrigated by a river *Kapila* also. The soil of these villages is very alluvial and fertile.

Passing to the discussion of the subject proper, let me first point out the state of tenancy in particular and the system of land tenure in general. Most of these villages are held by tenants, who are responsible to the landlords, generally citizens of Mysore, either by birth or domicile, who receive half the share of the produce of land, generally paddy, as rent which is paid seasonally or annually. This system of cultivation is technically known as the *Metayer system*, which predominates in the State. In very few cases only, rent is paid in money, at the rate of about Rs. 100/- per acre per annum. In some cases, the landlord has improved the resources of the land by providing for proper means of water-supply, such as dredging, channel constructing, etc. Generally, landlords rarely undertake this task of water-supply and thus improve

the land. This on the other hand is done almost in every part of Mysore, by the Government agency, viz., D. P. W. Department. Government rates and taxes are paid directly by the landlord which come to about Rs.8/- per acre per annum. The average size of a holding is about one acre.

In 90 per cent of the tenancy fields, the raiyat himself purchases plough cattle, and seeds and secures labour, and capital for purposes of carrying on the cultivation. Unlike the tenant raiyat, the landlord plays a passive part in the direct and actual work of production. Sub-tenancy and sub-letting is very rare. Peasant proprietorship exists in certain parts, but it is not so important as tenancy.

A field of about 2 acres is cultivated by the tenant's family, consisting of generally 3 male adult workers, 2 juveniles, and 2 or 3 women on an average, and 2 or 3 workers who are employed permanently, *i.e.*, as dependants of the family. These workers are fed and clad by the tenants, and a small wage is given to them once in a week or so, say a couple of annas. About 20 labourers are employed during the sowing season as well as the reaping or harvest season or seasons (as sometimes they get 2 paddy harvests), who are paid almost always in kind, *i.e.*, in the crop they raise. The money value of this remuneration of the hired labourers may come to about Rs.40/- per annum for a two acre holding.

The indebtedness of the peasantry is notorious in India, and Mysore I am afraid is no exception. The raiyat needs money to commence his work of production, in addition to the want of money to purchase plough, cattle, carts, indigenous implements, etc. He also wants to carry on certain unproductive expenses, such as marriage festivities and other ceremonies. For a 2 acre holding an annual loan of about Rs. 100/ is necessary. Here is a peculiar and distinguishing feature of Mysore, *viz.*, richer raiyats and landlords to lend money to the poorer raiyats. The Marwari's influence is more felt in the urban atmosphere. Gross interest are *always* paid in money at the rate of about 12 per cent per annum on an average. The Government of Mysore have rendered a very valuable assistance to the agriculturists by starting a number of *Co-operative Credit Societies* which finance the indebted peasantry in their productive operations. With regret, I have to point out that in some parts the raiyats have not at all taken advantage of this facility. On the whole, there is a healthy growth of these institutions in Mysore. The security offered by the raiyat is often the expected harvest and generally his person.

The method of cultivation near Mysore is not very backward. The Economic Conference of Mysore

is teaching the raiyats to adopt improved and scientific methods of cultivation, better implements, manure, seeds, etc., rotation of crops and so on. Seeds of a good quality are sold at the Government experimental farms and much more encouragement is expected in due course. The peasant is not utterly ignorant as regards his professional requirements. He is equally ready to adopt improvements, if he is sure of success more by example than by precept. His literacy and the education of his children are at a discount. The *Compulsory Primary Education Scheme* enforced by the Mysore Government will, I am sure, go a great way in improving the want of education, if the scheme matures still more successfully. *Technical education* is well in progress. On the whole the state of agriculture in Mysore is far from being unsatisfactory.

R. ANANTARAM.

Fish Manure.

Sir,—On the sea coast of this District we catch plenty of fish and it is used for manure also. On account of the establishment of a fish oil factory we get a better sort of manure therefrom. From the *Arthasadhaka Patrika* I learn with much pleasure that the cultivation of sugar-cane is fast extending in your State. Really it is very creditable that the Mysore Government encourages it in many ways. And I am sure you will outbid the Madras Government and help the ryots to manufacture sugar (ನಾಟ ಸಕ್ಕರೆ) at least.

Instead of your using oilcakes for manure at the expense of its being used for the cattle in your State, I would propose the use of fish manure. It is plenty on the Malabar Coast. As the export of coffee has been affected by the War, the demand for fish manure from the Coffee Estates has very much diminished and its price has fallen very considerably. It was, therefore, tried by my son for sugar-cane cultivation. The canes responded very well and grew very nicely and were stouter than otherwise. I would, therefore, strongly recommend your trying it for sugar-cane on the Hebbal and Hiriyur Experimental Farms in the beginning. I can get you cheap a small quantity for trial on those farms.

In this connection I may tell you that you may send some of your Agricultural Enthusiasts to your sugar-cane growing Districts and advise the jaggery

manufacturers to remove as much scum as possible from the juice boiling in the pan and afterwards prepare jaggery. I find that the jaggery which comes to our District from your State is full of dirt. Consequently it does not fetch a better price. My son tried to remove the same as much as he can and thereby the quantity of jaggery was a little less but it was more than made up by the higher price paid for the stuff. While the price per candy for the ordinary jaggery was Rs. 32 to 35, my son sold his for Rs. 50 per candy. Is it not therefore better to remove the scum as much as possible?

We tried an experiment by removing the rind of the Red Mauritius cane and afterwards crushing it in the Iron Mill and from the juice of such canes jaggery was prepared. We prepare cakes. The same was better than the "Madras Nat Sakkare." I give you this information so that you may ask any mechanic of your State to invent a machine to remove the rind from the sugar-cane. Dr. Coleman, your Agricultural Expert, might tell you if the red color of the rind of the Red Mauritius cane is not responsible to give a dark color to the jaggery. I may further tell you that the dirt in the jaggery of your parts might be ascribed to the use of *ragi* flour instead of lime. I may tell you here that the use of stone lime gives a better color to the jaggery than the shell lime. The *ragi* flour might have also dirt therein. Even if you use or want to use *ragi* flour I may suggest that it may be milled after all the stones and chaff and other dirt are removed therefrom. *Ragi* may be ground on the grinding stone and a liquid matter prepared and passed through a thin cloth so that its meal alone may pass through. Then the liquid may be allowed to stand in a vessel for a few hours when the sediment will settle at the bottom and only water will stand up. You may drain the water and the sediment may be dried. You will then get *ragi* meal, white and powdery, just like arrow-root. That may be used instead of *ragi* flour if you have any objection or difficulty to use lime. Then you may get white jaggery.

T. SUBBA RAO.

QUERIES.

Hints to Correspondents.

Write on one side of the paper only. (2) Write each query on a separate sheet of paper. This will facilitate answering questions as in many cases they may have to be referred to experts. Put your name and address down on every such sheet. No attention will be paid to unsigned queries. (3) Drawings for illustrations should be on separate sheets of paper. They must be made in black ink only on white paper—not in pencil or colour—and twice the size they are intended to appear, especially reference letters and figures. (4) Put titles to queries, and, when answering queries, put the number as well as the titles of the queries to which the replies refer. (5) No charge is made for inserting letters, queries, or replies. (6) Letters or queries asking for addresses of manufacturers or correspondents, or where tools or other articles can be purchased, or replies giving such information, cannot be inserted except as advertisements. No question is answered through the post. (7) Letters sent by correspondents, under cover to the Editor, are not forwarded and the names of correspondents are not given to inquirers. (8) As the space devoted to queries and replies is limited, they should be drawn up as briefly as possible. (9) To facilitate reference, correspondents, when referring to any letters previously inserted, should mention the number of the letter, as well as the page on which it appears. (10) All communications should be addressed to the Editor, *Mysore Economic Journal*, "Ringwood", Bangalore.

Query 6. Will you kindly let us know where moulding presses for soaps are available as also Thacker's Indian Directory 1918?

MANAGING DIRECTOR,
T. L. N. & CO.

ACKNOWLEDGMENTS.

Proceedings of the War Conference held at Delhi, 27th—29th, April 1918, Delhi. Superintendent Government Printing, India. 1918. Price 4 as. or 5d.

Mysore University Calendar for 1918-1919. Wesleyan Mission Press, Mysore.

RECENT PUBLICATIONS.

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Tracts for the Times. No. 2. *The Commercial Future and its Relation to Labour and Capital.* By J. B. Halcrow. Published for the author, 18, Coleman-street, E. C. 2. 16 pp. 4d.

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THE WORK OF THE NEW UNIVERSITIES.

BY PROF. J. WELTON, M.A., D. LIT.
(LONDON),

*Formerly Professor of Education, Leeds
University.*

IF one wished to express in a single phrase the function of the new universities, whose development has been so prominent a feature of the educational organization of England during the last half century, one could not, perhaps, do better than say that it is to manifest the modern conception of the practical value of culture. It was because the need for more precise knowledge and better founded principles in directing the increasingly complex activities of modern material civilisation was felt by some of the leaders of industrial and commercial life that the colleges out of which the new universities grew were founded. The belief that as highly trained an intelligence and as true a culture were needed for the successful conduct of a great commercial or industrial enterprise as for the work of one of the traditional learned professions was in germ in those early beginnings. We still, perhaps, await its full assertion in the one side and its full acceptance on the other. The antithesis between a liberal education and a utilitarian training, which is one of the worst legacies of the decadent Renaissance and which on the surface appears

so plausible, still has a hold over men's minds. That there may be a narrow utilitarian determination of the work of school or university is as certain as that for long years those institutions practically confined themselves to a course of study, the narrowness of which and its sterility for the great majority of those who received it were disguised under the high sounding name "a liberal education." But that an education is truly liberal which fails to fit the recipient to play efficiently the part he will actually have to play in life must be strenuously denied, and a training which does so fit him is utilitarian in the strictest and fullest sense. In short, no education is liberal which is not utilitarian, and none is utilitarian in the highest degree which is not liberal. This is the ideal which the new universities have to realise in practice.

THE OLDER UNIVERSITIES.

By the middle of the nineteenth century intellectual interests directly connected with men's actual purposes and activities were dominating the minds of the real leaders of English thought. Yet no organized means for training the coming generation on the lines of these interests were available. Attempts to re-organize the studies of the older universities were, of course, opposed to all the conservatism of tradition, and were resisted by men who were unable to conceive that any culture could deserve to be esteemed liberal which took man's thoughts and desires away from the placid assurance of an intellectual life finding its food in the past

and, hence, never fearing to have its cherished beliefs upset by any new and revolutionary discovery. Milton's conception of "a complete and generous education" as one "which fits a man to perform justly, skilfully and magnanimously all the offices both public and private of peace and war" had long been ignored, and the task of reviving it in a form adapted to nineteenth century English life was one only to be gradually accomplished. To what a considerable extent this has been done is apparent to all who are familiar with the Cambridge and Oxford of our own day.

The new conception of culture, however, produced, even as some seven or eight centuries earlier the older conception had done, institutions of its own. Doubtless the current idea that a liberal education was practically another name for classical scholarship and that this had no relation to anything directly useful in commercial and industrial life was so widespread and so strong that the new institutions showed at first a pronounced bias away from most of what had hitherto been regarded as characteristically university work. They were wholly or preponderatingly colleges of science. This was, however, a temporary rebound, and within a few years, humanistic subjects of all kinds began to find a place in their class-rooms, and now enjoy equal consideration with the newer scientific studies.

A WIDE CULTURE DEMANDED.

The arrangement of courses has, however, been too largely determined by custom and by words, and too little by a fresh and searching analysis of what should be asked of a liberal education in modern days, the outlook of which should be as wide as are the intellectual activities of modern town life. In such a life a man is called to share not only in industrial or commercial activities but in those that are political, economic, social, religious, and artistic; for opportunities at least for all these are before him. Every

town has its municipal library and art gallery, its concerts and theatres, its literary, artistic, and scientific societies; everywhere citizens have to decide by their votes economic and political questions of the utmost gravity. The modern state requires citizens of wide interests and of intelligence trained to be applied in many directions, each of which demands its own kind of knowledge. Its leaders of industry and commerce need not only scientific knowledge in the narrow specialist sense but the width and clarity of outlook which can see and give due weight to considerations outside the range of any particular industry or immediate trade interest.

For the interest of the individual, too, a wide culture is demanded. No matter how successful in business a man may be, he yet lives but a stunted spiritual life if he has no wide intellectual interests and no cultivated æsthetic tastes. In the whirl of actual business or professional life time and opportunity are alike wanting to begin the cultivation of these, even were inclination present, which is little likely to be the case where all such impulses have been starved in youth and adolescence—the very seed-time of enthusiasms.

A modern liberal education, then, would be wide in outlook; its aim would be the cultivation of habitual trends of interest; its success would be tested by power to deal with the varied requirements of a well filled life. Such a culture should lie at the basis of all the specialised knowledge each individual will need in his own particular profession or industry. This, again, is a revival in modern form of an older idea. In the mediæval universities the Arts course was preparatory to entrance into one of the recognised professional faculties, and it embraced—at any rate in theory—the fundamentals of every available branch of human knowledge. And it may be remarked that in America a general "College" course precedes specialised university work.

PREMATURE SPECIALISATION.

Unhappily, the modern universities had to attract men who were in a hurry and who were much impressed with the value of knowledge which bore on the industries of their district, and but little with that of any other kind of knowledge. So the universities allowed from the first a premature specialisation of studies, and left the provision of the wider and more general culture mainly to the schools, which were unable to provide it. This was most prominently shown in the sharp division drawn between "science" and "arts" subjects, marked by the two distinct degrees B.Sc., and B.A.—an innovation originated by the University of London. Where this division of the field of knowledge is rigidly maintained, a degree course fulfilling the requirements just indicated is impossible. Moreover, within each of these two faculties are honours schools in which only one subject or group of subject is studied. The outcome of the whole arrangement is that, so far as the official efforts of the university are concerned, an honours graduate may be devoid of either interest or knowledge in intellectual, social, and æsthetic life outside his own branch of study; and a pass graduate may be equally oblivious of one of the two great spheres of human intellectual interests.

The ideal of a modern university curriculum—at once liberal and utilitarian—would be a wide freedom of choice of subjects, so that each may be really an object of desire, with the single limitation that the choice must be divided between the two great groups. Only where an adequate general culture has thus been attained should specialisation be allowed to begin. Doubtless the attainment of such an ideal is still afar off, but the example of American universities shows that it is not impossible.

But in providing for a real general culture—that is to say, a cultivation of trends of interest in relation to the chief interests of modern life—the problems of the modern

university have not been solved. It stands, as has been urged, for the faith that no activity of life is repugnant to a liberal education. That is, and always has been, strongly manifested in the departments of technology or applied science, which have done, and are doing, admirable work. They are among the most characteristic and most successful of the ways in which the new conception of the interpenetration of industrial activities by culture has not yet found expression. But entry upon technical courses before the wide trends of interest of which we have spoken have had time and opportunity to develop, has, almost of necessity, a narrowing and sterilising effect upon life. A skilful professional may result, a really cultivated citizen can appear only by accident.

WIDENING THE OUTLOOK.

To lay down a rule as to the length of time needed for the general culture which should precede all specialisation is not within our province. Much depends upon the amount of culture brought from school. But it may, perhaps, be suggested that in the present state of things, it is not too much to ask of those who accept our general argument that two years may be given to such a liberal culture, and to maintain that the specialised work which in many cases would follow it would profit unspeakably by such a preparation of the mind of the learner. Further, it is essential that during the time of specialised work opportunity and encouragement should be given to keep alight the interests already kindled.

This leads naturally to the importance of the modern university providing as many and as varied occasions as possible for the widening of outlook and the awakening, sustenance, and direction of interests. A university can bring to its students men distinguished in science, in literature, in all forms of art, who, by occasional lectures, recitals, and other informal modes of stimulus, may attract and inspire now some

others of the students, and may at once widen their outlook and connect academic work with the actual intellectual and æsthetic interests of the day. At present such efforts, however successful they may be in themselves, tend to be too detached from the daily routine of study: one result of the reforms urged would be, it is believed, to make manifest that true academic study is itself closely related to the interests of life.

SOCIAL AND PERSONAL TIES.

Space does not avail for more than pointing out how important a part of the life of a modern university is every attempt to form social and personal ties between all its members. Wanting the collegiate life of Oxford and Cambridge, and with the homes of its undergraduates scattered over a wide area, such intercourse is less frequent and less intimate than is desirable. The remedy may be found in the future in a complete system of hostels. Probably most of those who have enjoyed the life at one of the older universities will think this the best solution, and, certainly, none other equally effective has yet been suggested. But care is needed that the hostel tone be the true tone of comradeship, and not that of even the best managed boarding school.

The modern university has, doubtless, much to do in working out its destiny, but consideration of the facts suggests that its true line of development will not be found amid the trammels of a past tradition, already moribund and out of relation to modern conditions, but in an appreciation of what modern spiritual and intellectual life demands, and in a courage to make trial of all plans which careful analysis of the whole situation seems to justify.

INDUSTRIAL COMMISSION'S REPORT.

BY PROF. V. G. KALE, M.A.

It will be neither fair nor useful to try to assess the value of the recommendations of the Industrial Commission's Report with only a brief printed summary as material for study. But while postponing a detailed review to a more suitable occasion, one may quite appropriately attempt to form a general estimate of the conclusions which have been formulated by the Commission on the industrial position and requirements of India. The two principles laid down at the outset as fundamental on the acceptance of which the carrying out of a programme of industrial development depends, are absolutely unexceptionable, almost axiomatic. The first principle is that in future Government must play an active part in the industrial development of the country, with the aim of making India more self-contained in respect of men and material; and second that in order to be able to do this, Government must arm itself with the necessary administrative equipment and scientific and technical advice.

With regard to the first of these principles, it is satisfactory to think that the urgent need of state initiative and assistance has been clearly recognized and emphatically advocated for the growth of industries in this country. For years together Indian publicists have persistently pleaded for the adoption of this policy, and pointed to the examples of nations like Japan where industrial prosperity has been attained by the people within a short period owing to the active part taken by the state in the promotion of industries and trade. Under the influence of *laissez faire* notions dominant in England and as a result of the misconceptions about the supposed incapacity of Indian people and the unsuitability of

Indian conditions for rapid progress in manufacturing activities, the state in India chose to drift along the current of time and circumstances, thinking that things could not be made better. It was pointed out time after time that only a hundred years ago, India occupied a position of importance as a country of skilled artisans and flourishing industries and that its decline was due to the fact that she could not keep pace with other countries which one after another, ran past her, the latest rival being Japan. We are glad that this view of the problem, ignored and pooh poohed whenever it was urged, has been rubbed in by the Hon'ble Pandit Madan Mohan Malaviya in his note attached to the report of the Commission. The official plea for masterly inactivity was based upon the arguments that the working of natural laws could not be interfered with, that it was futile for mediæval India to cast envious glances at the go-ahead nations of the west whose material prosperity was promoted by modern science and that the people of this country must help themselves to rise and not stupidly look up to Government which gave them peace and order and could do little more. It is to be hoped that the war was given the quietus to this line of reasoning and taught the lesson that the state can beneficially do a lot more than its police duties. Evolution of thought in this direction has taken place even in England. But what is vital to us in India is that the lesson should penetrate the placid, self-satisfied attitude of neutrality and inactivity which the State in this country has long assumed as a matter of principle.

The Industrial Commission has, therefore, done us a service in stating that Government must play an active part in the industrial development of the country. And the aim to be attained, according to it, is that of making India more self-contained in respect of men and material. To our mind the ultimate aim of industrial development is the increase of national wealth and the

promotion of the happiness of the people. The growth of industries is principally required for the increase of wages and profits and the wide diffusion of material and moral well-being among the mass of the population of the country. One of the effects of the expansion and progress of industries in the country will be to make India more self-contained in respect of men and material. Perhaps the Commission was thinking of the prospect of another war and the need of India making herself self-reliant, and had in mind the observations contained in the Montague-Chelmsford report on constitutional reforms on the military value of economic development, where it is stated that 'the development of India's natural resources becomes a matter of almost military necessity.' A more vigorous prosecution of industrial effort is being advocated in England also on these grounds. When India is, however, only at the beginning of things, it must be a remote possibility that she will be self-contained in respect of material and men, and we shall have to adjust our endeavour to the practical needs of the hour. The aim the Commission has placed before Government is, however, a laudable one, and there is no reason why a systematic attempt should not be made to reach it. Endowed with such natural advantages and having a variety of raw material, India may not regard the aim as an impossible ideal.

The Commission had, therefore, to review the present industrial conditions in India with the object of indicating how they must be modified, and the questions of capital, labour, education, training, banking, etc., which have an intimate bearing upon the problem of industrial development are discussed in the report one after another. It may be generally stated in this connection that the views of the Commission are perfectly sound and follow the lines which have been repeatedly urged upon the attention of Government by its Indian critics. The recommendations of the Commission will have to be critically examined before it is possible to pass a final judgment upon them, and it appears, several modifications will have to be suggested in the arrangements it has proposed for adoption by Government. But

if the state takes its advice to heart with respect to the radical change recommended in its traditional industrial policy and begins to work in right earnest, much good will immediately result. Extension of primary education and adequate provision for the imparting of technical and scientific education, on which the efficiency of labour and industrial organization must depend, constitute one of the most important problems to be tackled. Improvement of agriculture is another big question, and the Commission advocates the introduction of modern methods and in particular, of labour-saving machinery as one of the remedies. As to the supply of capital, the establishment of industrial banks is recommended and various other methods of financial assistance by Government, in particular, the provision of plant for small and cottage industries on the hire-purchase system, have been suggested. The Commission strongly supports the popular view as to the Government policy involved in the purchase of stores and the prejudicial effort of the existing system of railway rates on industrial development. As regards the latter, it holds that 'it should be possible to increase the rates on raw produce for export and on imports other than machinery and stores for industrial use'.

The problem of industrial development is large and complicated, and various factors acting and reacting upon one another, are involved in it. Government must first recognise that it is its duty actively to set in motion forces which will conduce to that development and that there are certain directions in which it must interfere with stimulate and regulate the process of expansion and growth. The Commission has clearly indicated the lines along which this work has to be done and there should not be the least avoidable delay in undertaking it. For this purpose, efficient machinery will be required and experts will have to be employed. Industrial departments and boards and services will have to be organized and the funds expended for this purpose will be a valuable investment. But great care must be taken to see that these establishments do not develop into costly ornaments, good to look at but of little practical use. It must be clearly borne in mind that the industrial development of India does not mean merely the exploitation of the resources of the country. It means the steadily

increasing capacity of the Indian people to work indigenous raw materials into finished products by their own initiative, under their own supervision and with their own hands. Outside experts and big salaried European officials are necessary in the beginning, but the aim must be to train Indians to dispense with their services and capture the whole industrial organization. Unless, therefore, a deliberate attempt is made to train Indians to discharge with efficiency and credit all the functions of industrial organizers, supervisors, experts, scientists and so forth, within a reasonable period of time, the prospect for real progress will not be cheerful. It is to be hoped that the talk of the unfitness of the Indian people in this connection will no longer be heard. This may appear like importing the racial element into the problem. But as a matter of fact all progress in this country is to be achieved for and by the Indian people.

Unfortunately, the question of fiscal autonomy for India was excluded from the purview of the Commission's inquiry and the Montague-Chelmsford report also has fought shy of it. But it is vitally connected with the problem of India's industrial development and the claim to fiscal autonomy to the Government of India under the control of the Indian legislature has been placed in the forefront of their demands by Indian leaders. The recommendations of the Industrial Commission are all very good so far as they go. But if the Indian Government is not free to order its fiscal and therefore, financial and industrial policy and if the people have no dominant voice in the determination of that policy, what assurance is there that the necessary measures will be taken for the country's economic development? We have heard a good deal about the changed angle of vision and the Montague-Chelmsford report strongly advocates a bold industrial policy. But between precept and practice there is always a wide gulf fixed as the people know from past experience. And though the Industrial Commission could not enter into this aspect of the question, a correct solution of India's industrial problems requires due emphasis to be laid on it. It is indeed no small matter that the Commission has sketched a comprehensive and bold programme for the Government. But after all, the test of the pudding is in the eating of it.

THE MYSORE AND WEST COAST LINK.

(Passing notes)

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MYSORE RAILWAYS.

AT present, there are two rather circuitous Railway routes linking Mysore City and the West Coast of India. These are:—

(1) Via Bangalore, Jalarpet to Ernakulam (very close to Cochin) 466 miles, to Beypore 448 miles and to Mangalore 591 miles, (Mysore to Bangalore 86, plus Bangalore to Jalarpet 87, plus Jalarpet to Mangalore 418 miles=591). A passenger travelling from Bangalore (elevation 2,960) to Mangalore would leave Bangalore about 8 P. M., by the Madras and Southern Mahratta Railway (Broad Gauge) change in morning into South Indian Railway (Broad Gauge) at Podanur Junction (elevation 1,300), and reach Mangalore about 7 P. M.

The reader knows well that Mysore Province stands on a plateau (on an average say 2,000 feet high) and hence to reach the sea coast, the route must descend the Western Ghats or mountains somewhere. The S. I. Ry. route, crosses the watershed in the Palghat Gap at Podanur (which has a level of 1,340 feet) and descends by negotiating the valley of Rivers Walayar and Koraiyar by a 1 in 80 grade. (Vide Fig. 1.) This means that while coming away from the coast the train requires the service of a Pusher engine. There are no tunnels on the ghaut portion of the line.

(2) The second Railway route outlet is via Bangalore, Arsikere, Dharwar and thence to Marmugao (433 miles) in Portuguese territory, or to Bombay (744 miles). To reach Marmugao, M. & S. M. Ry. (metre gauge) descends the Western Ghats at

2,300; and to reach Bombay, negotiates what are known as Bhore Ghauts (on a 1 in 37 grade) between Lonavala and Karjat.

Glancing at the map of Southern India (vide Fig. 1), one can not help seeing that there are other possible routes of reaching the sea coast, involving a less expenditure of energy and time than in any of the two routes mentioned above.

It must be added that there are many Public Works Department Roads leading away from Mysore State to the towns such as Mangalore, Udipi, Coondapore, Baindur and Honavar on the West Coast. A great activity of country cart traffic exists along these roads specially during the dry seasons.

Mention should be made of a *new* mountain or ghaut road, that is rapidly nearing completion to link KOGAR (on Mysore Plateau, vide Top Right hand inset diagram, in Fig. 1) with Bhatkal on sea shore. Kogar is already linked up with Shimoga (see Fig. 1) by a road via Avinhally and Sagar. This new ghaut road descends BHIMESHWAR valley and links the following places:— Kogar, Mailmanjai, Chandemani, Nagvalli, Bachodi, Hoparigai, Hasadu, Keru, Badaibag, Haliani, Hadvalli and Bhatkal. The main stream of Venkatapur River starts in Bhimeshwar valley and if at some future date, a small dam is placed across it, somewhere a little south of Nagvalli, the whole valley will come under efficient wet cultivation. A science graduate in agriculture has started a farm near Hoparigai and it is sincerely hoped, that he will meet with success.

Before going any further, the writer wishes to make it clear that the object of this article is to merely create reading matter of general interest, and hence *he does not intend to discuss the merits, advantages, etc.*, of any particular line, route or place. An attempt is made to help the reader to form, to a certain degree, mental pictures of interesting places, which he may

probably never reach in his life time, by means of simple descriptions and a few illustrations.

Besides the two existing Railway lines described, the important lines (linking Mysore with West Coast) which have been suggested or surveyed up to date are enumerated below. (Vide Fig. 1).

1. Hassan—Mangalore. 108 miles.
2. Mysore—Yedatore—Coorg—Tellichery. 155 miles.
3. Nanjangud—Wynaad--Tellichery (or Beypore) 130 miles.
4. Shimoga to Bhatkal. 116 miles.

Hassan (elevation 3,108) is already a Railway Station on the new Mysore Arsikere chord line (about twenty-five miles to the south of Arsikere.) A line could start from Hassan, cross the watershed of India somewhere between Kudraimukh and Mercara and end at Mangalore (vide Fig. 1). The distance between Hassan and Mangalore as per Mr. Grove's survey (1899—1901) would be about 108 miles.

The second Railway route would commence from somewhere near Yedatore (a Railway Station on the Mysore Arsikere Railway line) pass through Coorg, south of Mercara and end at Tellichery. Tellichery to Yedatore station, the distance would be about 127 miles and to Mysore City station about 155 miles. (Vide Fig. 1).

The third route through Wynaad may start from Nanjangud, negotiate Kabani River valley to Manantody, go through Peria or Vayittiri Pass and terminate at say the sea ports of Azhikal, Tellichery or Beypore. To make it clear it may be added that in the northern part of Malabar above the ghauts, there is a large plateau called the "Wynaad" at an elevation of about 3,000 feet, the greater part of which as regards soil, rainfall and climate is eminently adapted for the growth of tea.

Fourthly, we come to the Shimoga Bhatkal Railway Scheme which is receiving considerable attention at present.

The line would start from Shimoga (an existing station on the M. S. M. Railway) pass through Kumsi, Arasalu, Anantapur, Sagar, Talguppé (using 1 in 100 gradient) and descend the ghauts through *Mailmanjai Pass*, by negotiating Bhimeshwar valley (and using 1 in 40 gradient) eventually reaching Bhatkal as a seaport on the West Coast, as the terminus. (Vide Fig. 1).

The writer has described the Shimoga Bhatkal alignment fairly fully in his July 1917 article in this *Journal*. He would, however, draw the readers' attention to the *Frontispiece* drawn by the writer, which depicts the portion of Western Ghauts that would have to be negotiated.

En passant it may be mentioned, that if Mysore were to be connected with Erode (an existing station S. I. Ry., from where Mangalore is 307 miles away), it would reduce the Mysore to Mangalore (on sea coast) distance from 591 miles to about 400 miles, and would provide a direct outlet from Mysore to south of India. (Vide Fig. 1). This project has been under consideration for a long time now and is sure to be taken up in the near future.

To a passenger travelling for the first time to Mangalore (by S. I. Railway route) the journey is of considerable interest, as from Podanur southwards the scenery is of interest and also because he passes from a great *Kannada* speaking tract into a district where the prevailing lingo is *Malyalum*. By the way, the word *Malyalum* itself means "mountains and rivers."

The writer has travelled from Bangalore to Mangalore by the S. I. Ry. route in the height of monsoons and he was able to see the country at its best. The 1 in 80 descent down the ghauts from Podanur to Olavakot (vide Fig. 1) junction was interesting and the scenery while skirting the Walayar and Koraiyar valley was very pleasing to the eye. Not only was the indirect education received by studying the new country useful, but the training



FIG 2 SHEWING MANGALORE PORT FROM THE BACKWATERS

R. N. MIRZA

Fig. 2.

received by the enthusiastic traveller in vicinity of Podanur in linguistic exercises was also excellent. One has only to glance at the name of all the small towns in this locality (such as Machchaikavundanpalaiyam, Mallappakayundanpudur, Kanthaikavundansalai, Kudiraiyatampalaiyam, etc.,) and feel convinced for ever. (These names are not shewn in Fig. 1).

The Railway line runs through lands abundantly covered with cocoanut and arecanut (beetle-nut) trees. Nearly every one has seen one time or other, coolies climbing cocoanut trees to the very top, to break off the fruits and drop them on the ground, from where they are collected. But a question is very often asked "how about collecting the small arecanuts in a large plantation" for an arecanut tree has a very small diameter (five to six inches) and is very tall and requires great effort to climb even one tree. The method is this. The gatherer climbs one tree to the very top, and drops (on to the ground) all the nuts, and when finished, sways and swings the tree and at the right time throws out a rope with a hook at one end, to clutch the top of an adjoining tree. Having pulled the top of the adjoining tree sufficiently close, he jumps on to the same to repeat the performance over again. After all, it is but a poor imitation of the Langoor (Tropical Forest monkey) which can race over tree tops at ten miles an hour or even more.

As will be seen from the Map (Fig. 1) the S. I. Ry. line after nearing the sea coast at Shoranur crosses many rivers, displaying some fine examples of bridge structure work, and in some parts runs quite close to the sea shore.

Regarding the ports on the West Coast, (lying between Honavar and Cochin, a distance of 340 miles roughly) the writer would like to point out here the following facts to avoid reiteration.

(1) At present, all the ports are open roadsteads for ocean going steamers. Most

of the ports have backwaters at the mouth of one or two rivers, in which shallow draft lighters or country boats can find shelter (such as Mangalore, Honavar, etc.) The sand bars at the entrance of all the ports which have a river and backwater change their dimensions yearly and generally the backwaters are very shallow (2' to 6' in depth). At some places even 600 feet of sandspit may be washed away during the monsoons. During the monsoons steamers do not call at those ports.

(2) All the principle coast towns between Honavar and Cochin export tea, rubber, cocoanut products, timber, coffee, pepper, fish, and fish manure and import rice, grain, dates, and European goods.

(3) In each case the steamer anchors one and a half to two miles away from the shore in four to five fathoms of water and goods are transported from the shore in lighters ranging from twenty to thirty tons capacity.

(4) Good godown accommodation is provided at practically all the principle ports such as Calicut, Tellichery, Cannanore, etc.

(5) Native crafts from far off places come and go in large numbers. Calicut, Beypore, Tellicherry, Mangalore, Malpi, Coondapore, Bhatkal and Honavar are the ports of call for steamers, the other ports between Calicut and Honavar are not touched, and may be considered as minor ports.

A brief description of only some of the important places is given below. Only important and special features are touched upon, for the writer realises that if a reader wants general detailed information he can always refer to the excellent S. I. Ry. guide books or Government Gazetteers which give detailed description of historical places, population, temperature, climate, birth rate, revenue, etc.

Calicut is the distributing centre for Wynaad tea districts. There are two piers each about 750' long with a T head. Several, five and one ten ton cranes are provided

to handle 100 to 200 tons of goods per day. Produce from Wynaads come in by carts along roads and by boats along the backwaters from low lying country.

Beypore. Great export trade in tiles. Madras Fishery Department has a station here for canning and curing fish. Large quantities of coal arrive here for S. I. Ry. Bamboos and Timber are floated down the Beypore river for exportation.

Tellicherry. A very picturesque port protected by a natural breakwater of rocks. The landing place is also protected by a mud bank and hence steamer can sometimes have communication with this port when all other ports are closed. A Pier is being built and a seawall nearly 600 feet long on each side of the Pier has just been completed on which trolley lines will run connecting the Pier with the Godowns. Country carts bring in coffee and sandalwood and take back salt, manure, etc.

Azhikal on Baliapatam River. Great quantities of timber are floated down the river and are either exported by sea or carried by S. I. Ry. Labour seems to be in plenty. Steamers hardly call here. But vessels up to 100 tons can cross the bar. The S. I. Ry. Company has a very fine bridge across the river and the writer thought the scenery at junction of river and sea a grand sight.

Mahé is a French Port at mouth of river Mahé. They say up to lately it was a coaling station for French steamers which when calling had to anchor about two miles from the shore.

Mangalore is the terminus of the S. I. Ry. on the West Coast and an important place. (Vide Figs. 1, 2 and 3). Important tile making and coffee curing works. Big college and education centre. The Collector has his Head-quarters there. Many steamers call here. The Bombay Steam Navigation Company runs a good service of coasting steamers drawing about 16' to 20'

of water. The journey from Mangalore to Bombay is made in four days, the steamers calling at Marmugao, Karwar, Honavar, Bhatkal, Coondapore and Malpai. (Vide Fig. 1 and its inset.)

A leading Hindu gentleman of Mangalore has told me that steamers once used to anchor, a little to the West of the South shore Ferry station, (see the mark "A" close to the South Ferry station on the inset map in Fig. 1) but now they can not come so far in, and have to anchor outside, at the spot marked by an anchor, vide the inset diagram of Fig. 1 and illustration No. 3, which shews under mark "S" a steamer at anchor far out in the sea. Now this is worth thinking over from a scientific point of view. Is it due to the building of the Railway Bridge which has very long approach embankments?

The writer made the journey from Mangalore to Bhatkal by road (a distance of ninety miles) during monsoons and as will be seen from the map, had to cross eight *unbridged rivers* which were then in full flood. The Kanara Public Conveyance Company (and not Public Convenience Coy., as one gentleman described it) runs a Motor service from Mangalore to Coondapur, a distance of sixty miles. The Company runs a fleet of cars, one car plying backwards and forwards between two consecutive rivers. At every river crossing passengers have to tranship and board the next car, which have a capacity of nearly twenty people. The company seems to favour a lot of "Federals" and "Garret" cars of American make.

The traveller leaving Bangalore at 8 P. M. reaches Mangalore at 7 P. M., next day. The S. I. Ry. have a well furnished special room (besides the usual waiting room) with two bath rooms, which can be engaged on payment of Rupees two. There is a refreshment room run by Messrs. Spencer & Co. The motor leaves Mangalore about 8 A. M., and (Fig. 4) shews the motor starting station. The journey is very interesting.

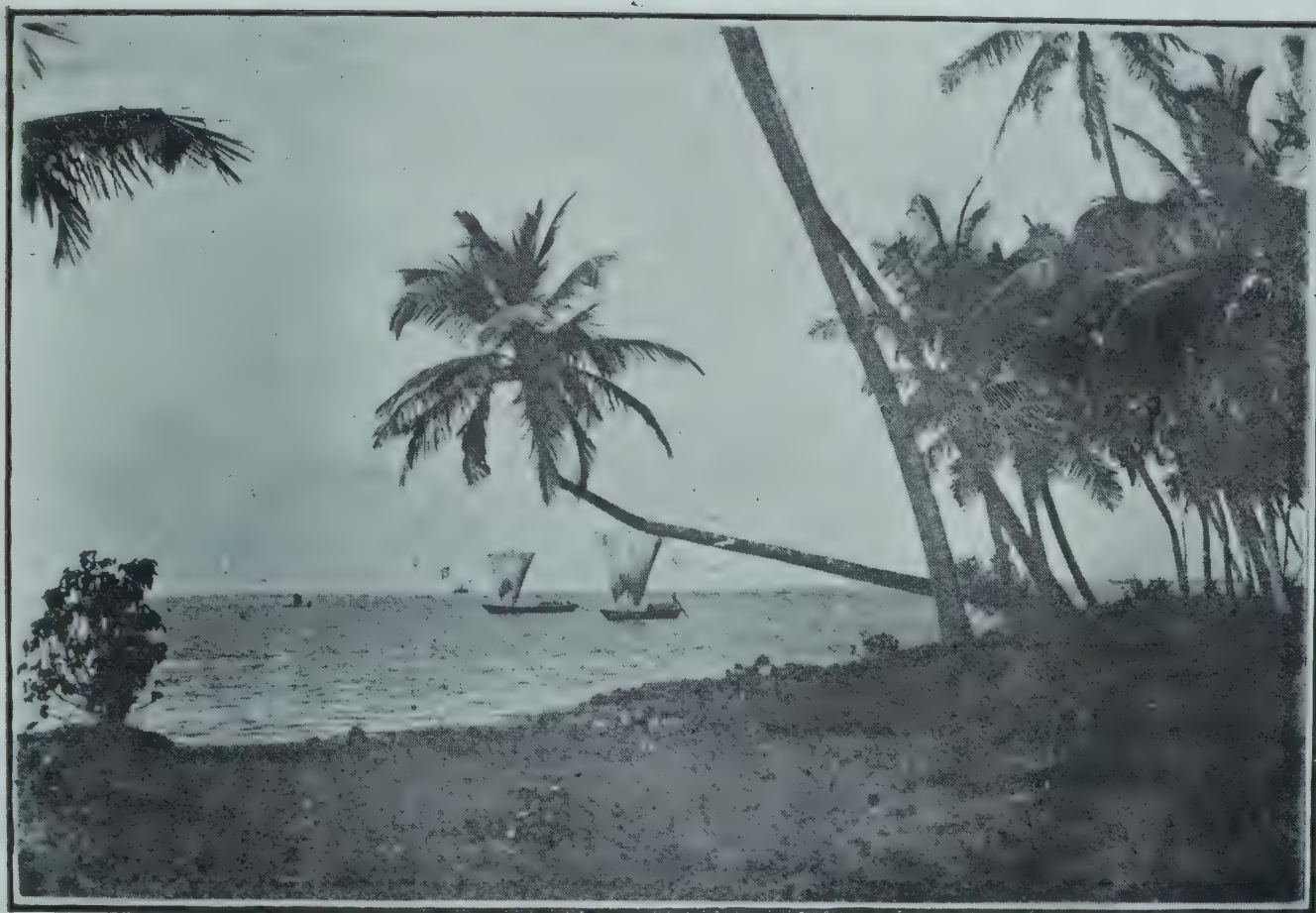


Fig. 3.

MANGALORE ROADSTEAD FROM SHORE.

Opposite the Entrance to the Backwaters. Just below mark "S" on illustration is seen Steamer at anchor. The Illustration shows typical West Coast scenery.

New people, varied costumes, different scenery keeps one attention engaged.

If you are travelling first class, you will have the honour of sitting next to the most important person in the motor vehicle and that is the chauffeur, for remember please that he wields and twists these motor levathians, and your fate is in his hands. The writer found them very polite, courteous and was entertained with descriptions of the places passed through. He (the writer) was in great awe of one of these "Knights-of-the road", a man with tremendous long moustaches, and whose coat was adorned with several bright medals dangling from multi-coloured ribbon bands. However, it was reassuring to find that he was after all a peace loving citizen of the Empire, and a very humble disciple of His Holiness the Pope, whose kindly features were engraved on the medals. To digress for a moment, the writer would like to add, that all along the run, he (the writer) noted the great efforts of some of the Roman Catholic priests, even in the most secluded and lonely parts along the coast. Leaving their homes in fair countries, some of these men come out here and bury themselves in these lonely parts—the sluggish backwaters of civilization—to devote and sacrifice their lives to one ideal—the *uplifting of the lower humanity*.

The sea is in continual view from the main road leading from Mangalore to Coondapore. While travelling along the road one can not help noticing all along the coast, the peculiar flat topped elongated spurs (overlaid with blackened and hardened laterite cappings) which the writer described in his September, 1917, article "Nautical Notes on Bhatkal". Why are the tops of these spurs so flat and why have they all practically the same altitude above the sea? One is almost inclined to blame the nature for being frivolous when he sees as a rule one solitary tree sticking up in the midst of a vast flat and barren area on the hill top.

A halt was made at Udupi village which is quite close to the Malpai harbour (vide Fig. 1). Nearly every Mysorean knows the *famous temple at Udupi*. Fig. 5 shews that temple. An enormous *jatra* is held here once a year.

Next to Cochin, a promising place as a possible good harbour in *Madras Presidency* on West Coast is Malpai, about 37 miles to the North of Mangalore. Here there is the usual backwater with a bar outside, but the chief feature is a chain of three island known as St. Mary's Islands (vide the inset diagram in Fig. 1) running N. N. W. with a small gap between each island. These islands are about $1\frac{1}{4}$ mile away from the bar and even at present coasting steamer can lie quite close to the chain of the islands. Malpai exports tiles. Coondapore twelve miles to the North of Malpai is the terminus of the motor transit. There is the usual sand bar and a very large backwater, (which presents rather a pretty appearance) formed by rivers Kolluru, Chakranadi and Haladi.

To proceed to Bhatkal one has to cross this one mile wide backwater and reach Ganguli on the opposite shore from where the journey has to be continued by cart or by Tonga service (which is run by the Hindu Transit Company). The writer must confess that after the rapid journey in a motor bus, he looked forward to this primitive mode of conveyance with some trepidation for after all a tonga journey is extremely slow and trying. Fig. 6 shews a scene along the journey. At one crossing, *the Tonga had to be bodily carried across the river*, which was flowing "surfeit" with heavy flood waters. Fig. 7 shews how this feat was accomplished. Kindly disposed readers will forgive the exhibition of our luggage in the open boat seen in the left hand side of the picture.

The writer is sure that *Fig. 8 will arouse some interest*, when he points out that it represents a small part of the main road from Ganguli to Baindur (en route to

Bhatkal), flanked on the West by the ocean and on the East (*i.e.*, the left hand side of picture) by river *Kolluru* flowing south. The river flows in a nice well behaved manner till it is quite close to the ocean, when the trouble begins. Two conflicting forces of river and sea produce the curious formation of a narrow sand bar which keeps the matters in equilibrium and so the river runs parallel and quite close to the sea shore for many miles.

Nearing Baindur, one begins to see the outline of the Western Ghats (forming the boundaries of Mysore State) approaching closer and closer to the shore. About a mile to the south of Baindur one meets the Shimoga, Kallurkattai, Nagodi, Kollur, Baindur Road. This road descends the Western Ghats at Nagodi, 2,000 altitude (*vide* Fig. 1) about two miles to the west of the famous Peak "Kodachadri."

Kodachadri Peak which is 4,402 high above sea level is on the Mysore Frontier and adds greatly to the grandeur of the scenery as viewed from the ghaut road. At about 3,000 feet altitude on this hill, there is a temple devoted to Tiger God, and a small Travellers' Bungalow not much patronised, as it is not quite an easy matter to reach this Bungalow. Besides, all provisions and supplies for many days should be taken by the visitor along with him.

Between Baindur and Bhatkal (about twelve miles apart) runs the *Bombay and Madras Presidency Boundary* from east to west. The writer has written about Bhatkal fairly fully in his July and September 1917 articles in this *Journal*, still the readers will kindly permit him to say a few words more regarding this port.

(1) Bhatkal harbour is ten miles away from the Mysore frontier and divides the distance between Mangalore and Marmugao (both of which ports are provided with railway connections) almost equally, hence the introduction of railway at Bhatkal would (besides linking the interior with the coast)

greatly aid those areas which find both Mangalore and Marmugao too far away.

(2) Bhatkal harbour possesses certain geographical features which would help the construction of a good monsoon weather harbour, and which features, the writer does not find, amongst any of the other harbours from Mangalore to Honavar. A glance at the map (*vide* inset Fig. 1) shews one outstanding feature and that is the beneficial position of the oval shaped lighthouse hill. Secondly, the large gap between the lighthouse hill and the elongated spur marked "160 feet high" (*vide* Fig. 1). This gap after necessary excavation could afford ideal shelter for ships. Borings taken, have shewn that, if there is a layer of rock, it is at an average depth of thirty feet below ground level.

(3) If even a cursory glance is cast over an Admiralty Nautical Chart shewing the sea depths and country from Mangalore to Honavar, it is at once seen that five fathom line (*i.e.*, thirty feet depth of water contour) approaches closest to the shore, only at Bhatkal coast. The writer has been closely associated with all the Boring and Marine survey operations carried out at Bhatkal, but he feels that an article is not the proper place for discussing all the results of such investigations.

(4) Bhatkal is not far away from a region where water-falls seem to be in plenty. The writer has already spoken in his July, 1917, article in this *Journal* regarding the world famous Jog Falls (*vide* Fig. 9) and another fall with 800 feet drop, (*vide* Frontispiece) 28 and 9 miles respectively, far away (as the crow flies) from Bhatkal. Jog Falls (formed by Sharavati river dropping into a chasm 830 feet deep) has a hydro-electric productive capacity of three hundred thousand Horse Power.

Travellers while arranging to visit the Jog Falls often make the mistake of assuming that Gersoppa village and the Falls are one and the same place. Far from it, Gersoppa village (to which place passengers go from coast by small boats over River Sharavati) is only fifty feet above sea level, while Jog



Fig. 4.
MANGALORE MOTOR TRANSIT STATION.



Fig. 5.
UDIPI'S FAMOUS TEMPLE.

Falls (often called Gersoppa Falls) are eighteen miles away by a ghaut road and are at an altitude of 1,600 feet above sea level.

The *frontispiece* clearly shews the location of the 800 feet waterfall, a visit to which means a lot of foot work up the ghauts and through dense forests. The catchment area of Sharavati river at the site of the Jog Falls is 772 square miles. There are other waterfalls also to the north and south of Jog Falls situated in wild and rugged country but these need not be mentioned here.

Leaving Bhatkal and proceeding northwards, we reach Shirali on the Venkatapur river, our-and-a-half miles away. There is the usual backwater and sandy bar. About a mile from the bar there is a line of rocky islets which would appear to enclose a site for a harbour, wherein vessels may anchor and may be served by lighters which would retreat into the river for shelter, but comparing the similiar features, Malpai appears to be the better of the two.

Murdeswar is nine miles to the north of Bhatkal. There is no backwater here. A small rocky peninsula bearing a temple juts out nearly half a mile into the sea and has another long line of rocks known as Hawkins reef about a mile to the north of the same. No steamers halt here and the writer only saw a few boats there and very little activity. The shores are covered with long stretches of cocoanut plantations.

Twenty-two miles to the north of Bhatkal is Honavar. It stands on the Sharavati river and has a most nasty sandy bar. Steamers call here but the anchoring is difficult in bad weather. The river at Honavar is nearly a mile wide and is very deep in many parts. Boats carrying merchandise ply between Honavar and Gersoppa village (eighteen miles to the east of Honavar) from where country carts convey it to Sagar and Shimoga. Honavar is a Taluk Head-quarters.

In conclusion, the writer begs to say that much more can be said and written on the subject of linking Mysore State and West Coast, but if such an attempt is made here giving technical details, histories, costs, trade analysis, etc., the contribution would exceed the limits of "*passing notes*" and would assume the proportions of a "*Report*", and it is doubtful whether the average otherwise busy reader cares for that.

SOME OF OUR IMMEDIATE NEEDS.

BY M. VARADAIYA, B.A.

AT the present time there is a strong movement afoot in all civilized countries with the object of securing domestic supplies of raw materials. This movement has been noticeable in Mysore as elsewhere and the special object has been to ensure the maximum development of the resources with which the State has been endowed by Nature.

When we speak of resources we usually have in mind material things, such as financial, mineral, agricultural and forest resources. It would appear, however, that this is a rather limited construction of the meaning of the word "Resources," for, with all of these material resources there is the presumption that one has the ability to use them. Wealth owned by an idiot may not be to him a resource, but rather a liability. A mining deposit that no one knows how to work is hardly worth calling a resource. There are vast and wonderfully fertile lands under the Marikanave Channel, but they can be truly regarded as resources when they are most profitably used by intelligent men. Our wealth, mineral deposits, fertile lands, forest materials, etc., can be regarded as resources as far as they can be intelligently used by resourceful men in the State. Whatever the material resources of a country may be, they cannot be made fully effective except by resourceful men. No country can develop its possible resource to its full advantage unless there are resourceful men who can turn the resources to profitable ends.

Mysore is a country which is said to be wonderfully rich in possibilities. The development of the resources in this country so far is mainly attributable to the resourceful men that are in, or have come to, Mysore. Our present Agricultural machinery, our machines

for the manufacture of food products, our machines for the production and utilization of electrical energy, our machines for the stamping and moulding of metal, our machines for the manufacture of sandal-wood oil, and a large number of other kinds of machines are evidences of the resourcefulness of our citizens.

The Great War has demonstrated the pressing need of a more vigorous investigation and exploitation of the natural resources of our country, with a view to supplying the growing industries with raw materials which have heretofore been mostly imported. The importation has been necessary or desirable since some of the raw materials required and particular grades of others are not obtainable at present in Mysore or the material may be obtained from outside for less than the cost of production and delivery of the Mysore material. In other cases, however, it is due to the fact that the domestic products are not always prepared in the form most suitable for the purposes for which they are required. Frequently, the buying and selling methods are irregular, varied, and unsatisfactory. For example, the Mysore producer, through lack of capital, is often at a great disadvantage, being unable to advertise extensively and thus attract attention to his product and secure a trial of it, even though his price be lower and his product as good as, or better than, the imported article. In many cases, the consumers of certain minerals are not aware that they are produced in the country, often quite close at hand. There are a number of newspapers and trade journals which reach the manufacturers and it seems that even small advertisements judiciously placed by the Mysore producers will aid greatly in increasing the amount of domestic materials used in our manufacturing industries.

It has already been found that Mysore contains several raw materials within her borders which have in some cases been found by examination and test, to be in every way

the equal, in quality and adaptability, of the imported product and which, in many cases, can be produced at a considerably less cost than even the original pre-war cost of the imported articles. Each season of work is bringing to light new sources of supplies of these materials not hitherto discovered. To make the State of Mysore as self-supporting as possible in the matter of every sort of commodity has been the predominant ambition of our Government and the practical goal which is now being striven for by our industrial and commercial interests. This proposition will probably find acceptance on all hands, but between the acceptance of a principle and the achievement of a tangible result there are many stages, each presenting its own problems of compromise or negotiation with established interests. All these difficulties require to be combated most energetically. Many of our investors are generally not familiar with the nature and vastness of the possibilities of our country. Considerable amount of educational work is therefore being done with a view to substantial success. The Mysore Economic Conference, with the aid of the Department of Industries and Commerce and the technical Departments of Government, has been awakening the people of Mysore to a just conception of the several fields of activities that are open to them and the efforts of these bodies have already yielded practical results. The old order of things is undergoing a gradual and steady change and people are beginning to get out of the old rut and break fresh ground. The old arts and industries have received a great impetus and a number of fresh ones sprung up. The scheme sanctioned by Government for the manufacture of iron and steel from the iron deposits in the Bababudans is a most signal instance of a new industry in Mysore and will, it is hoped, be an achievement of the first order. Every detail of this industry has been carefully worked out, supplies of raw materials investigated and ascertained



Fig. 6.

SCENE AND SCENERY NEAR BAINDUR.

to be obtainable in sufficiently large quantities; railway communications are being provided and the work is expected to be started as soon as the machinery for which orders have been placed is received. The Department of Industries and Commerce has been instrumental in the installation of a number of power plants for lift irrigation, in the manufacture of jaggery by improved methods, in providing expert assistance for the erection of industrial concerns, such as rice mills, saw-mills, oil mills, etc., in holding weaving demonstrations and supplying fly-shuttle slays throughout the State, in the manufacture of soap, which has proved itself to be commercially successful and in the establishment of factories in Bangalore and Mysore for sandal-wood oil distillation which have already been yielding huge profits. Attention has also been paid to the development of the tile industry, metal industry, carpet manufacture, glass and bangle industry, bone manufacture, leather industry and investigations carried on in respect of paper-pulp, manufacture of pencils, establishment of cotton mills, match making, porcelain manufacture, manufacture of cyanamide, manufacture of sulphuric acid, manufacture of cement paint, sodium carbonate, etc. Much valuable work has been done also in respect of industrial education, in order that the inhabitants of the country may be utilized to the best advantage for themselves and for the State. Activities of this nature are being pursued from year to year. The progress achieved in the several activities undertaken is due to considerable forethought, ingenuity, organization and research on the part of our administrators and other technical officers of the several Departments concerned, as well as to public enterprise.

To keep abreast in the great race for expansion of industrial development occurring in other civilized countries of the world, it is very essential that our resources should be much better known, and their exploitation made much simpler of accomplishment than

at present. It is of imperative necessity for us therefore to know as definitely as possible what our State is capable of producing, what it is importing and what it is exporting. Information on these heads is not easily available at present. Many of our valuable raw materials are lying dormant largely because no information is available and no assistance is obtainable at low cost for the purpose of ascertaining the quantities, qualities and values of the materials. The best available data for each individual commodity is absolutely necessary, so that it may be at the disposal of producers, manufacturers and traders. We have further to make a closer study of industrial limitations and measures to overcome them. The basis of our success depends upon :—

- (1) The abundance of suitable raw material at a cost comparing favourably with the cost of raw material in competing centres of the respective industries.
- (2) Adequate local facilities for manufacturing and transportation.
- (3) Local market for the products and opportunity to extend the market within reasonable limits.
- (4) Skilful management capable of modifying manufacturing methods according to local conditions and of improving constantly on such methods, both with regard to cost and quality of product.
- (5) A more widely extended banking system in which every ryot will have confidence and to which he will resort as readily as to the Government Savings Banks. The capital in Mysore, vast as it may be, is like a thinly distributed ore and needs a vast organization to bring it together.

We cannot at the same time overlook the fact that the progress of our schemes depends largely upon labour, which is the outstanding feature in production. The success

of any undertaking is generally due to the skill, exertion and good will of those who work for it.

Arrangements have lately been made for the supply of commercial information and statistics to the public by the Department of Commerce. Steps are also being taken for the establishment of a Bureau of Research in Mysore to help industrial enterprise and for affording facilities to the Mysore Bank in order to better enable it to finance industry and trade in the State. The activities in these directions will no doubt contribute largely to a rapid expansion of industries in the State, but it would not probably be out of place to mention here some of the steps which require to be immediately taken to meet the needs of those who are interested in the industrial development of the State and are prepared to venture into untrodden yet lucrative paths of industries and commerce.

(1) To make an exhaustive survey and an inventory of our natural resources.

(2) To supply information to the public as to the raw materials available in the State, their characteristics and industrial and commercial uses.

(3) To assist producers to find appropriate openings for raw materials and primary manufactures.

(4) To furnish manufacturers throughout the State with information as to the sources of supply within the State of raw materials which they need.

(5) To investigate the composition and value for commercial purposes of raw materials in communication with manufacturers and the Mysore Chamber of Commerce and with the advice of technical committees composed of technical and commercial experts.

(6) To display exhibits which are of general and educational importance and which would show the relation of raw materials to finished products over a wide range of industries, so that it may be an enlightening experience for business men to see them.

(7) To assist in the development of promising young businesses which are hampered by the need of capital.

All these factors are essential also to establish confidence in the people that success will be attained and that industrial ventures can be a sound outlet for their money.

SHEEP REARING AND KAMBLI WEAVING IN THE TUMKUR DISTRICT.

BY G. SANTAVIRAPPA, B. A.

THE ravages of the present war have affected the economic condition of the whole world in respect of every article of agriculture and industry. Sheep among live-stock and wool among the requirements of textile industry are amongst those which have considerably suffered. After the war the supply of sheep and wool to meet the demand would be a serious question for solution. It appears desirable therefore that the existing resources of the District in this respect and the possibilities of development with a view to increase the supply are examined.

The statistical returns show that there are in the Mysore State 27,50,000, sheep and to this number Tumkur District contributes 500,000 which is 18 per cent of the total head of sheep for the State.

Sheep rearing is not specially confined to any particular area in the District. It is carried more or less on the same scale in all the Taluks as the following table indicates in which numerical strength in the head of sheep in each Taluk and the number per square mile in the same area are given:—

No.	Name of Taluk	No. of sheep	No. per square mile
1	Sira ...	75,200	125
2	Maddagiri ...	65,250	148
3	Gubbi ...	63,000	114
4	Pavagada ...	62,300	137
5	Kunigal ...	54,000	141
6	Thuruvekere ...	53,200	280
7	Tumkur ...	45,000	99
8	Chicknaikanhalli ...	31,500	73
9	Tiptur ...	30,500	100
10	Koratagere ...	16,260	96



Fig. 7.

CROSSING THE WEST COAST RIVER IN THE MONSOONS.



Kolluru
River

West.

Fig. 8.

A REMARKABLE SCENE.

River flowing parallel to the Sea Coast.

There are in the District 122 sheep per square mile, Turuvekere coming up highest with 280 and Chicknaikanhalli lowest with 73.

The general impression is that the available grazing land does not admit of cattle breeding or sheep breeding on a large scale. But an examination of the statistics on the subject discloses the fact that more than 1 to 3 cattle graze in one acre of gomal and kharab land available in each Taluk area. The following statement gives an idea of grazing land available in each Taluk area and the head of live-stock grazing on one acre of grazing land.

No.	Name of Taluk	Extent of gomal & kharab land in acres	Agricultural stock	No. of cattle per acre of grazing land
1	Tumkur ...	86,084	1,85,463	2.1
2	Maddagiri ...	52,040	1,31,555	2.5
3	Koratagere...	41,187	81,357	1.9
4	Sira ...	95,573	1,49,015	1.6
5	Pavagada ...	79,634	1,53,021	1.7
6	Chicknaikanhalli ...	95,968	1,30,323	1.3
7	Gubbi ...	96,869	2,13,846	2.2
8	Tiptur ...	67,949	86,455	1.2
9	Turuvekere...	52,111	94,249	1.8
10	Kunigal ...	58,467	2,01,775	3.4
District		7,25,882	14,22,115	1.9

Thus there is considerable scope for sheep rearing in all Taluks in the District.

The quality of the existing breed is inferior as compared with that either in some other Districts of the State or in other countries. Efforts are, however, being made to improve the breed by introducing foreign varieties of ram such as Dumba Rams or

Hybrid Rams. There has not been any organization on up-to-date lines to start sheep farms. It is left in the hands of the shepherd (Gollar) whose ignorance is typical. He is in the utter dark as to what is going on beyond his village. The standard of his knowledge as to sheep farming is what it was ages and centuries ago. The idea that the quality should be improved in order to keep pace with the world's advancement in sheep breeding has not struck him in the least. If a shepherd is questioned about the quantity of wool which his sheep yields he would refer to an answer to an equally ignorant person, *viz.*, kambli weaver who clips his sheep twice a year. There are no grazing lands specially set apart for sheep grazing and the available grazing lands are mostly neglected and fresh young grass is grazed over before it attains any growth thereby leading to great loss of stock when there is a drought. The question of feeding which is an important factor in sheep breeding has not received any attention. It is of the utmost importance that attention should be paid to the question of regulating the use of grazing grounds, if sheep farming should succeed on a large scale. It deserves scientific investigation and cannot therefore be left to the shepherds.

In respect of wool spinning and weaving, this District has about 1,640 looms in 168 villages in working order. The following statement gives for each Taluk the probable quantity of wool which it produces, number of looms in it, the number of kamblies made, the average number of kamblies per loom, the quantity of wool which it imports or exports.

No.	Taluk	No. of sheep	No. per Sq. mile	Quantity of wool in seers	No. of looms	No. of kambliies made	No. of kambliies which local wool could give	Kambliies per loom per year	Remarks.
1	Sira ...	75,200	125	75,200	542	55,000	7,520	100 Buys 2,84,880 lbs. of wool.	
2	Maddagiri ...	65,250	148	65,250	156	7,000	6,525	45 Just enough.	
3	Gubbi ...	63,000	114	63,000	126	22,000	6,300	175 Buys 94,200 lbs. of wool.	
4	Pavagada ...	62,300	137	62,300	280	60,000	6,230	214 Buys 3,22,620 lbs. of wool.	
5	Kunigal ...	54,000	141	54,000	22	1,000	5,400	45 Sells 26,400 lbs. of wool.	
6	Turuvekere ...	53,200	280	53,200	36	2,000	5,320	55 Sells 19,920 lbs. of wool.	
7	Tumkur ...	45,000	99	45,000	49	5,000	4,500	100 Enough.	
8	Chicknaikanhalli ...	31,500	73	31,500	304	26,000	3,150	85 Buys 1,37,100 lbs. of wool.	
9	Tiptur ...	30,500	100	30,500	110	12,000	3,050	109 Buys 53,700 lbs. of wool.	
10	Koratagere ...	16,260	96	16,260	15	500	1,626	33 Sells 6,756 lbs. of wool.	
		4,96,210 or 5 lakhs.	122	4,96,210 or 5,00,000 seers or 3,00,000 lbs.	1,640	1,91,000 or 2 lakhs	49,621 or 50,000	120,843,000 lbs. or about 9 lakhs of lbs. of wool are imported into the District.	

It will be seen from the above statement that Pavagada, Sira and Chicknaikanhalli Taluks import a very large quantity of wool.

The District is able to produce about 3,00,000 lbs. of wool, whereas it requires about 12,00,000 lbs. of wool to make 2,00,000 kambliies in a year.

No other District has so many kamblii weaving looms. Mysore District being next to Tumkur with 1,273 looms, Chitaldrug 514, Bangalore 230, Kolar 182, Hassan 140 and Shimoga 115, and amongst single places which have a fairly large number of these looms, Chicknaikanhalli Town is first with 124 looms.

The aforesaid statement gives an estimate of 120 kambliies a loom for the District, which is about 10 kambliies per month per loom. There are some places in which the weavers have taken to agriculture and hence it is that the average per month per loom goes so low as 2 and there are places like Pavagada where the industrial class of people devote their whole time to weaving and thus monthly average there is 18.

An estimate of production of wool and of manufactured goods has not been made. It is ascertained that sheep owners are generally paid Rs. 20 per two clippings in one year of 100 sheep.

Thus 5 lakhs of sheep in the District fetch the shepherds Rs. 1,00,000.



Fig. 9.

JOG FALLS.—800 Ft.

Formed by Sharavati River tumbling into a Chasm.

The quantity of wool which sheep in this District yield is said to be very poor. One sheep on an average yields from the two clippings one seer of wool. Thus the quantity of wool produced is roughly 5 lakhs of seers annually or 3 lakhs of lbs. of wool, *i.e.*, the shepherd gets annas $5\frac{1}{3}$ per lb. of wool. The average value per lb. of British India superior wool is estimated at 77d.

The wool of this District is next said to be far inferior as compared with either British India wool or wool produced in other Districts of the State.

The weaver makes 10 kambli's out of the wool got from 100 sheep, *i.e.*, about 50,000 kambli's are made in one year. They make kambli's for *Malnad* and Ceylon estate coolies which are the cheapest; they make kambli's for the *gollars* which are next in quality; they make kambli's for the wear of the agriculturists, and they make also some superior kambli's of the value of Rs. 10 to Rs. 20. But this last class of kambli's are very few. Average price per kambli at the present market rate may be taken at Rs. 4 which gives the weavers 2 lakhs of rupees, *i.e.* the weavers get as much as the rearers get, out of the wool locally got. But the production of kambli is much more than 50,000, *i.e.*, about 2,00,000 kambli's are annually made.

Thus about 3 times the quantity of wool required is imported into the District. Roughly the value of out-put at the current market rate may be taken as 8 lakhs of rupees.

After all, the industry is in its crudest condition. It has not been at all developed and the difficulties are attributable to the most surprising ignorance on the part of the weavers. The terms *Golla* (shepherd) and *Kuruba* (kambli weaver) in Kannda are generally used to indicate an ignobly ignorant person. That low position of civilization and knowledge, the two classes of men have had for thousands and thousands of

years and in their hands more or less exclusively are two most important industries of this District, *viz.*, sheep rearing (agricultural industry) and wool weaving (textile industry). Their very blood is tainted with ignorance. It wants new blood to improve the industries and that new blood is the industrial education of their children. If that cannot be done in the near future, the two industries must be taken on hand by the present educated class of people. But the latter is no sufficient and efficient remedy, as the bulk of people who by tradition have been in this business will still be kept in ignorance and what little they have been doing for centuries will be taken away from their hands. Hence they must be lifted up.

The Economic Conference has enabled us to see where we are in the world's industrial development as it is disclosed in respect of two industries in this District and this knowledge of our low status in industry is in itself a great advance.

"If the intelligence of our people is kept undeveloped, their skill untrained, their activities unstimulated, the average standards of working and living will remain low, and the country will continue to be populated as at present by ignorant, unskilled and indolent masses who in times of scarcity or stress will be unable to help themselves. Safety therefore lies in educating the people and equipping them with skill and science and keeping them active." (From the Dewan's speech, Birthday session of 1913.)

Every member of the Economic Conference is charged with the duty of taking action in all possible directions, to improve the industrial condition of these people.

ECONOMIC CONDITIONS IN MADURA EAST.

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IT was my privilege recently to make a tour to Aruppukottai in the Ramnad District for the purpose of making investigations as to the economic condition of the people in general. I did not take a survey of the town, but by means of house to house inspection, numerous interviews, and tours to near-by villages a great deal of valuable information was gathered, and I take pleasure in sending it on to the *Journal*, for there are some things which I think will prove of interest and perhaps of value to your readers.

Aruppukottai is well situated in the centre of a very fertile black soil cotton country. It is twelve miles inland from Virudupati, which is its outlet on the South Indian Railway. A branch railway line has been surveyed to run through Aruppukottai and open up many important sections in Ramnad, but like so many other pieces of much needed work it must wait until after the war. The main roads out of Virudupati are not kept in good condition. There is a Motor Bus service to Aruppukottai, and along the road one met a constant stream of bullock bandies going to the centre laden with raw cotton. It is five years since I last visited this town, and I was pleased to note several evidences of progress. The whole countryside gives one the impression of prosperity; the people look well, and are doing well. Good substantial new houses are going up every where; nearly all the houses have tile roofs. The town is extending in every direction, and the population has reached about 30,000.

A SYSTEM OF FERTILIZATION.

The first thing that impressed me was a splendid system of fertilization which is practised by all the ryots. Some ten years

ago the Nadars introduced this system, and now it is carried on to a large extent throughout the district. A large plot of land has been set apart just outside of the town as the dumping ground. To this place is brought the sweepings and dirt of the village. It is gathered, sometimes by the Nadars themselves, or they may buy it of bandy men for annas 8 per load, and dumped in separate heaps in the fertilizing field. Then the ryots cart the rich black silt from the tank beds, when the water has dried up, and put that on the village refuse, allowing it to saturate for several days. After a short time the ryot comes, mixes these two heaps carefully together, and then carts it out to his cultivation fields. This prepared soil is distributed over a field to the amount of from 30 to 50 bandy loads according to the needs of the soil, and it is repeated generally once in two years. The mere fact of its being practised everywhere in that locality shows its utility. On my asking about the results obtained from this system of fertilization, I was assured that the ryots are now receiving from 50 to 100 per cent increase in the yields of their fields over their returns of ten years ago. Everywhere I went in that part of the country the same system was being practised. I can commend it heartily; its results prove its utility; and it is so simple and comparatively inexpensive. Will not other centres also try this system?

COTTON WEAVING.

There is a large and flourishing community of cotton cloth weavers in Aruppukottai. They have adopted the practice of weaving their cloth in long lengths. They told me the most common cloth they deal in is fifteen sarees long, that would be about 100 yards. For mixing the thread for the work they use a large circular frame, one such frame for several families. The sizing is done in a plot of ground 100 yards long, and which will hold about a score of warps. The land is a communal holding, and the

weavers take turns in setting up their warps. It takes six or seven days to weave one of these long lengths.

I was interested in their primitive bond looms. They have both the bond thrown and the fly shuttle looms. I urged them to invest in modern and quicker looms. I said I know of looms which will turn out five times as much finished cloth in a day as you now do. One man said he could weave one cloth a day of about six yards long. I said I can tell you of a loom which will enable you to weave five such cloths in one day. Another man was making a clear profit over expenses of only two annas in a day. I said I can tell you about a loom which will help you to earn at least twelve annas in one day. Another young fellow bright and ambitious, who is building a house in order to get married is clearing Rs. 10 a month. I said why do you not invest in a loom which will enable you to save 40 or 50 Rs. in a month? Well, there are a number of reasons which keep these people back from trying a new loom. The first reason is that they know their present loom. It is cheap, costing only about Rs. 10 to construct, and it is simple. When anything goes wrong with it they can at once mend it. A new and modern loom will cost Rs. 250 to Rs. 300, many of these poor people could not raise that amount of money, and an expensive machine is more or less complicated so much so that an ordinary workman can not mend it or adjust it when it goes wrong. It is like asking a man to exchange something which he knows very well for something which he does not know, and when it means his food and living, one can hardly blame him for being conservative. There are two things needed in a place like Aruppokottai to help the weavers to branch out into a larger life, and they are demonstration and money. I am perfectly convinced that if a loom—a modern, up-to-date loom, that will turn out five or six times as much work as their old looms, were set up in the town

and its advantages absolutely demonstrated, it would not be long before a number of such looms would be set up in that town. I was impressed with that possibility on seeing that five weavers called on me to have a talk about a new loom. They said they would willingly pay down Rs. 300 for a loom, if it would do the work, and if it were simple enough for them to work.

Then there is the ever-present question of money to buy the loom. A great many of the weavers are too poor to realise the price of a new loom, and yet they are deserving of encouragement and help. Here is a splendid opportunity, as it seems to me, for Government to step in, as it does in Bombay, lend money to weavers for the purpose of buying new looms (for a long period at low interest) and I am sure it would revolutionise the weaving industry in South India. There is a great need for some such progressive movement in our midst. India is not ready for large scale production yet. The cottage industries of the people must be preserved, but if they are to compete with modern conditions they must be reformed and speed up. The introduction of a new loom, and the providing of money to buy that loom, are greatly needed in our day.

Another thing which impressed me in connection with these weavers was the lack of any co-operative society among them. That community served to me to afford an ideal opportunity for a successful co-operative society. I spoke to them about the principle of co-operation, but they looked blank, knew nothing at all about it, and many have feared that it would not work. I asked them where they bought their yarn. They said from the merchant dealer, or at least they do not buy it, he allows them the yarn they require, and they deliver up to him all their woven cloths. The merchant dealer truly performs a great and most convenient service to the weavers. He buys all their yarn, takes their cloths,

and disposes of them. They do not need to trouble their heads about supply, or the state of the market, or the disposing of finished goods. That is all done for them, not as a service of love, but as a good paying business by the merchant dealer. He pays about Rs. 5 for yarn for a given cloth. He pays the weaver annas twelve or one rupee to weave it into cloth, then he sells the cloth for Rs. 6½ or Rs. 7 so that on every day's work of a weaver he will make eight annas or one rupee. It is possible for one merchant to control perhaps 500 weavers and so his daily income could be anywhere from Rs. 300 to 500. Now, my question is—why does not a community like that save that money to itself! It can do it if it would form a co-operative society, control its own buying and selling, and with the profits it could supply its own needs for new and modern looms. I tried to drive that argument home as best I could, but with what success I do not know.

OTHER MATTERS.

Land has risen in value greatly during the last fifty years. Land which half a century ago cost only Rs. 10 per acre now sells at Rs. 400 per acre. There is not much changing hands or selling of lands. People are far more anxious to increase their holdings than to dispose of them. There is not much indebtedness, the chief cause of the indebtedness that there is, is due to court charges. When a man has saved a little money he is not content until he gets into a dispute with some one, and has spent all his savings in court fees. The average holding is about ten acres, per family; an economic holding is about six acres so that one can see that the economic condition of the people is satisfactory.

The following table will show the returns from their chief crops per acre :—

Crop		Cost of production	Returns	Profits.
		Rs.	Rs.	Rs.
Cotton	...	10	100	90
Cholam	...	5	60	50
Tobacco	...	50	250	200

So that if a man has an assured supply of water, and can cultivate tobacco, his holding of only five acres will bring in very good returns; while a man with ten acres under cotton can also do well.

I enquired the source of their supply of cotton seed, and found, much to my pleasure, that the ryots were making use of the Government's Experimental Farm at Koilpatti, and were getting cotton seed from that place. Then I asked—do you adulterate your seed! One or two men denied doing so, but one man said,—yes, we do adulterate, and it is a common practice everywhere through here. That gave me then an opportunity of condemning strongly the practice of adulteration. India will never be able to compete with other nations while she continues adulteration, short weights and measures, and general inferior production.

It was a privilege also to get miles away from the centre, and a long way off the main roads of the district. I have said it was a privilege, not however for one's comfort, but to increase one's knowledge and experience of the everyday conditions under which perhaps 70 per cent of the sons of India live and work continually. That is the real India, and that is where Reform must win its great triumphs. I spoke above of the bad conditions of the main roads, but the country roads—the regular lines of communication between village and villages, are utterly bad beyond description. In Ramnad one of the greatest economic needs to-day is an adequate and proper village road system.

We were passing by one village in our country bullock cart, bumping over the rocks and rolling from side to side worse than a ship at sea in a heavy storm, when my friend who knows the district thoroughly said—Do you see that well over there! I looked and saw an ordinary village well. He said over one lakh of rupees have been spent in law cases over that well. It cost originally about Rs. 250 to construct, and

the people of the village—two castes, have been fighting over it for years until they have squandered over a lakh of rupees in trying to settle their dispute. That is pathetic in the extreme—an economic waste; what an amount of good could that lakh of money have done for the people of that village in roads, sanitation, in education, in general progress, and yet it was worse than squandered in law suits. We passed by another well, inside the enclosure were several women drawing water, outside sat a woman with her pots to be filled. It was a caste well, and the poor woman outside was a pariah. She could not get water until some caste woman gave it to her. She may have to wait there for hours, for half-a-day before being served. Now, that too is an economic waste. That woman should have been working in the field. Her work, production, agriculture were all stopped because water was refused to her. Why, from an economic point of view it would pay caste people to supply water to their agricultural servants at once, I will go further and say, it would pay caste people to construct wells at their own expense for the pariahs in order that there may not be this waste time from agriculture to get the household water-supply. This is not a small matter, it has in it principles which are fundamental to India's economic progress.

These are the things which impressed me most on that interesting trip. I recommend heartily Aruppokottai's system of fertilization. One of the greatest economic needs of the villages is a good and adequate road system. For the weavers I would advocate strongly the organizing of a co-operative society for the purpose of doing their own buying and selling, and I would urge the introduction of up-to-date looms.

THE TRAVANCORE UNIVERSITY.

By C. I. VARUGHISE.

THAN the present war, which was foisted upon an unwary world, by a cold calculating nation of assassins who were able, through a whole generation, to devote all their resources of science and knowledge to the preparation of a hideous conspiracy against their neighbours and the liberties of mankind, a more powerful agency has never been known, which has already produced and will continue to produce such stupendous changes in political, economic, industrial, religious and educational matters, nay on the very face of the earth. Events are taking place so rapidly, and ideas are changing so suddenly, that we cannot say what the state of affairs will be in a few years. Of the many schemes for reconstruction, which are now engaging the serious attention of the public, as well as of the Governments of the world, it is gratifying to see that education occupies a most important place. Though there are a few who are accustomed to regard educational matters as something apart from the practical needs of life, the number of those who regard education as the foundation of all national greatness, both in point of wealth and of intellect, are legion. "Education is one of the good things of life which should be more widely shared than has hitherto been the case amongst the children and young persons of the country", said Mr. H. A. L. Fisher, Minister of Education, when he introduced into the Parliament, on 10th August, 1917, the most democratic, and in some respects, the most revolutionary Education Bill that has ever been brought before the House, at a time when the most devastating war known to the world is being waged, and when all the energies of the nation are directed towards its successful prosecution.

Even in Germany, whose menace in the matter of her superior system of education Lord Haldane had dreaded for years, more than he had dreaded the menace of war, the discussion, since the war began, about the bearing of educational influence upon national life, has been even more eager and general than in England. In the field of education the present movement of German thought is of high importance to those who are interested in the deeper issues of the war. For, as Mr. M. E. Sadler, Vice-Chancellor of the University of Leeds, observed in an address delivered some years ago, at a meeting of the Allgemeiner Deutscher Neuphilologen-Ver-band, at Frankfurt-on-Main, of all foreign influences upon English methods of teaching and educational ideals the German had, during the last hundred years, been the most formative and penetrating. It had touched every grade of education from the Kindergarten to the University. Even in all other countries concerned in the war, there has been a growing recognition that education is not a luxury, but a national duty, and that a certain standard is the irreducible minimum for every individual. In short, an enlightened policy in education is the order of the day over most of the civilised world.

Lord Haldane, in an address recently delivered in Glasgow, under the auspices of the Educational Institute of Scotland on 'Larger Aspects of the Education Question,' said among other things that upon the training of the coming generation rested the future of the nation. As we succeeded and raised the level so we would put ourselves in a position of strength relatively to other nations who were our legitimate competitors. It was mind that governed the mass, and intelligence, training and knowledge alone enabled us to occupy a foremost place. Our people are now thoroughly alive to the absolute necessity of a better training for the future generation

if we are to continue to hold our own in the race in which nobody stood still. It was not enough to get the first place. We must always keep it. That meant, not that our old things are bad, but that they are out of date now, and we have to proceed to new things which would keep us abreast of the movements of the time. Sir John Lockyer, President of the British Association, once traced conclusively and convincingly the intimate relation existing between the provision made by a nation for the higher education of its people and the position taken by that nation in the ceaseless competition between the great countries of the world.

Elementary education is now the right of all in almost all civilised countries. Secondary education is open to the rich only, while the chances for a poor scholar to get from the Secondary School to the University, although they exist, are far too few. In short, the prizes of the State are in reality far too much reserved for the upper classes. Lord Haldane, Chancellor of the Bristol University, in an address delivered in 1912, hazarded the conjecture that if we had all the Universities in the world concentrated in England, we would find that it was only a limited percentage of the population that would be fitted by natural aptitude to take full advantage of them. Only a few can be chosen; that results from the fact that the order of nature does not permit us to be born equal. But the many may and ought to be called, even if the few are chosen. What is really essential is that every one should have a chance, and that there should be the nearest possible approach to equality of educational opportunity. Without this, the sense of injustice will not be eliminated, and we shall, in addition, fail to secure for our national endeavours the help of our best brains. Here is where the city University has its part to play, and in the years to come, no limit

can be placed to its development. It is likely to become the dominant and shaping power in the system of national education. "You find," said Lord Rosebery in a speech delivered not long ago at Liverpool University, "that every great city in the Kingdom is demanding that it shall have a University within its boundaries." At a gathering of the Institute of Journalists in 1902, Sir Edward Russel, Past President, said: "I will say as a sort of prophecy that I think the course of events is going to be in favour of the establishment, in this country, of Universities of a new kind in every great centre of population, and for myself I do think that will be a change for the better. We can not expect to carry Oxford and Cambridge all over the country." The rise of the Midland Universities of England, which were in the first place Colleges originally founded without any chartered title almost exclusively for teaching in the practical arts, and which subsequently merged in the Victoria University, next seconded to begin the world as separate Universities, each on its own account, but adhering to a common scheme of studies in conformity with the needs and aspirations of the new epoch, is a symptom of the movement of civilization towards higher forms of existence—higher than Plato dreamt of, or the Stagyrte, with his definition of man as a "citizen by nature."

In the Halifax Despatch of 1854, the Court of Directors announced their decision on the policy of the more extended and systematic promotion of general education in India, and one of the means by which this policy was to be carried out was the establishment of Universities at the Presidency towns. This policy was reaffirmed in 1859 when the administration was transferred to the Crown. In founding these Universities, the Government of India of that day took as their model, the examining University of London, then believed to be best suited to the educational conditions

of India. Since then, the best educational thought of Europe has shown an increasing tendency to realise the inevitable shortcomings of a purely examining University, and the London University itself has taken steps to enlarge the scope of its operations by assuming tutorial functions. The model has, in fact, parted with its most characteristic features, and has set an example of expansion which has not failed to react upon the corresponding institutions in India. Lord Curzon's Indian Universities Act of 1904 recognised the inherent defects of the old Universities, and effected certain reforms tending to the promotion of study and research. But the conditions of University education was still far from satisfactory, in regard to residential arrangements, control, the course of study and the system of examination. The Government of India, therefore, reviewed the whole question of University education and came to the conclusion, that although the day was far distant when India would be able to dispense altogether with the affiliating University, it was necessary to restrict the area over which the affiliating Universities had control, securing in the first instance, a separate University for each of the leading provinces in India, and secondly creating new local teaching and residential Universities within each of the provinces in harmony with the best modern opinion as to the right road to educational efficiency. It may then be possible to sanction the conversion, into local teaching Universities with power to confer degrees upon their own students, of those Colleges which have shown the capacity to attract students from a distance, and have attained the requisite standard of efficiency. H. E. Lord Hardinge, when he laid the foundation stone of the Benares University, reiterated the policy in these words: "It is the declared policy of the Government of India to do all within their power and within their means, to multiply the number

of Universities throughout India, realising as we do that the greatest boon the Government can give to India is the diffusion of higher education through the creation of new Universities."

Travancore occupies a foremost place in education among the States and Provinces of India, and can not at the present time afford to lag behind, when they are marching forward. The Government of H. H. the Maharaja taking into consideration, the expansion and improvement of Collegiate education in the State, and thinking that the time has arrived to consider the question whether a University for Travancore should be constituted, have already appointed a Committee with Mr. L. C. Hodgson, Director of Public Instruction as Chairman, to enquire into and report on the necessity for the establishment of a University adapted to local conditions and environments. The demand for such education has in recent years, been steadily increasing, and there is reason to believe that it will be more insistent in future. Mysore, when it sought to establish a University in 1914-15, had three Government Colleges with a total strength of 700 students, two private Second Grade Colleges with 101 students and forty-five High Schools out of a total of 292 recognised by the University of Madras. If so, the claim for the Travancore University seems not a whit less strong. Travancore has four Government Colleges and two private Second Grade Colleges with a total strength of about 100 students and nearly forty High Schools.

Travancore wants a University, not in the distant future, but now, and not a copy of Madras or any other existing Universities in India. Blind imitation of even the most venerable and successful models existing elsewhere can not be of much benefit unless there is some correspondence between our ideals and their ideals. The problem has to be thought out in terms of our life. A clear idea of the needs and demands of

Travancore and of the manner in which they can be satisfied, and the adaptation indispensable to realise the ideals should precede the formulation of the scheme. "As regards higher education, I should like to call attention to the scheme for the proposed new University at Dacca which has been framed by a Committee. We have not yet received a definite proposal from the Government of India. There are certain points that require consideration, but the presentment of this scheme opens a new chapter in higher education in India. Existing Indian Universities have been framed on the model of London University, but the new University at Dacca will have eleven constituent Colleges, all of which will be residential, and will be somewhat similar to the Universities of Oxford and Cambridge. It is to serve as a model for Indian Universities in the future." So said the Hon'ble Mr. E. S. Montagu in his Indian Budget speech for 1913. More than six years have now elapsed since the Committee was appointed, yet the Dacca University is still a matter for the offer of explanations for delay in Government communiques, and it now transpires that the scheme can not be brought within the range of practical politics by the financial stringency caused by the war. Hence we have now to look to other quarters for a model.

No one will deny that the existing Universities in India have done good work in the past, and are doing good work at the present time. They represent probably the best that could have been done under the circumstances. To criticise them because they are not ideal, as the Bishop of Madras said a few years ago at Bangalore, would be like criticising the seed because it is not a full grown flower, or the acorn because it is not an oak. It is true, as the late Dr. S. Sathianadhan observes in an article on University Education in India, that the critics of education—and their number is legion—

are guilty of exaggerated pessimism in the view they take of the general results of higher education, more especially of University education in India. The time has come to protest strongly against this reckless condemnation of University education which seems to be the fashion at the present day. The fact is the majority of critics who speak and write about University education and its effects merely echo the sentiments which is obtained at second-hand from a few who, probably with a desire to see certain existing defects remedied, lay undue emphasis on them; and this exaggerated view is echoed and re-echoed throughout the country by the unthinking multitude. The Indian system encourages cram, pure and simple, the passing of examinations is the one chief aim of the Indian student, the higher education is made subordinate to a rigid system of examinations; the Indian graduate is lacking in originality; he is wanting in practicalness and thoroughness, in habits of exactitude and directness of action; it is his acquisitive faculty, his memory that is taxed most, and his creative faculty is left undeveloped. These are some of the criticisms that are copied from one journal into another, and that are passed from the lip of one speaker to that of another. The advocates of the present system aver that these defects are unduly magnified, and that such criticisms give a very distorted idea of the great work the Universities are doing. There may be some truth in their contention that the spirit of reckless criticism so characteristic of the masses sometimes takes possession of even educationists, and that it is because they apply to Indian Universities that have not more than half a century of history behind them, the standards of judgments which they generally apply to English and other Universities whose origin is almost lost in the mists of a remote antiquity. But with all this advocacy made with a flourish of trumpets, in behalf of the Indian Universities, we are sure, none will ever affirm that they

either meet the needs of the situation, or satisfy the demands of these changing times when men all the world over are going down to the root of things, scrutinizing and questioning hitherto accepted principles in politics, sociology, legislation, economics and education, or to quote Lord Morley, when not merely forms of Government, but the very structure of society were to be subjected to popular scrutiny.

The conception of a University has undergone great transformation in recent years. The term University, in its original acceptance, was used to designate any aggregate of persons associated in a political, religious or trading corporation, having common interests, common privileges, and common property. The inhabitants of a town, the members of a religious house when addressed in formal instruments were addressed as a University. Nay when the whole body of the faithful is appealed to as Christian men, the ordinary phrase made use of by a lay or ecclesiastical potentate, when signifying his wishes or intentions, is *noverit Universitas vestra*. A University in this sense regarded as an aggregate of persons, might be localised, or it might not. Its members might be scattered over the whole Christian world, or they might constitute an inner circle of some larger community of which they though a Universitas, formed but a part. An University in its original signification, meant an Association or Corporate body, a combination of persons for one specific purpose. When men associated together for purposes of trade, they were a trading Universitas; when they associated for religious objects they were a religious Universitas; when they associated for the promotion of learning they were a learned Universitas. It was in this sense that the term was first applied to modern, as opposed to ancient, educational bodies. They were originally designated *Universitates doctorum et scholarium*, corporation of teachers and taught, and were in many cases confined to one

special study, as law at Bologna, or medicine at Salerno. At a later date, the modern idea of Universality crept in, and they were called *Universitates studii* or schools of universal learning. A University according to Newman, is a place for acquiring a great deal of knowledge on a great many subjects. Although popular ideas regarding the function of a University have considerably advanced, his definition is, in one sense, broad enough to cover all subsequent developments in principle and practice. The Commission, appointed in 1910 to inquire into the London University under the presidency of Lord Haldane, laid down as the function of a University, that it should be a body which takes the whole realm of human thought and knowledge as its own associates its teachers and students together as closely as the condition of their work will allow, and so forms a community with one spirit and one aim which in course of time will develop an individual character and create conditions which will affect the mind of all who come within its influence.

The question of educational reconstruction with a view to correlate education to life by placing it on a utilitarian basis is producing great stir in the region of English politics and letters, and the problem of adjusting the claims of Literature and Science in education has been pushed to the front. On this problem, it is gratifying to note the attention of the best thinkers in England and elsewhere has been focussed. This controversy seems to be reaching a satisfactory solution. The well-known English writer, Mr. A. C. Benson, in a remarkable address on educational ideals, delivered sometime ago pointed out that there was really no conflict between the interests of science and humanities, and the same is the text of an admirable pamphlet issued by Sir F. G. Kenyon of the British Museum on "Education Scientific and Humane," being a report of the proceedings of the Council of Humanistic Studies. The

principles enunciated therein seem to deserve very careful attention by the University Committee.

To the question of University training, Mr. H. H. Asquith has often given the answer, "Do not let your University become a factory for turning out specialists. A University is not a technological institution. You would not exchange your *literæ humaniores* for a king's ransom". Not that there is any incompatibility between the claims of literature and science as instruments of education. To quote Mr. A. J. Balfour, the philosopher and man of letters, "You must drink deeply from both sources of inspiration." It is purely and simply a question of how you handle your literature and your science. Indeed there was a time when it seemed as if the polytechnic spirit might control the new educational movement, and when scholarly critics were horrified at the prospect of Young England emerging from his technological studies as a skilled craftsman and accomplished scientist in a small way, but little better than a Caliban in all that pertains to taste, to feeling, to general intelligence, wholly ignorant of the history of his country, of its institutions, of its literature, and in all probability wholly indifferent to them. It was a time when the University of the new type was merely a commercial asset. But this dismal view of higher education fell far below the rising standard of the period. In the Universities of the new type, the ideal that inspires the entire scheme of studies is the motto of the University Extension Society that a man needs knowledge not only as a means of livelihood, but as a means of life; and in this scheme, nothing is more remarkable than the eminence accorded to what are usually called the subjects, Humanities, and the extent to which even the studies of the more immediately utilitarian order are pervaded by the Humanities. The permeation of the utilitarian courses of instruction by the

spirit of Humanities is exemplified in the Birmingham Commercial Faculty - whose students just because they are to become business men, must qualify in subjects long recognised as liberal culture.

There was a time, says a great authority on education, when men of business accustomed to see closely to profit and loss, used to think that the work of a University was worth effort and expenditure only in so far as it produced an aptitude for industrial and commercial production. But this idea is now discredited, and the part played by science and by general learning in the production alike of the captain of industry and of the extension of invention is far greater than was the case a few years ago. Applied science is in its best form only possible on a wide foundation of general science, and the fruitful scientific spirit is developed on a basis of high intellectual training, the training which only the atmosphere of the fully developed University can completely provide. What is true of science in the narrower sense is also true of learning. It is only by the possession of a trained and developed mind that the fullest capacity can, as a general rule, be obtained. We are coming more and more to realise that the best specialist can be produced only after a long training in general learning. The grasp of principle which makes detail easy can only come when innate capacity has been evoked and moulded by high training. Our administrators, our lawyers, our doctors, our engineers and our inventors can not, without it, keep in front in the race, or hold their own amid the rivalry of talent, unless their minds have been so widely trained that the new problems with which the ever-increasing complications and specializations of modern conditions confront them, present nothing more formidable than new applications of fresh principles which have been thoroughly assimilated. Without having reached this level, they cannot maintain their feet.

There seems to be an evil tendency in India of making specialities of things which ought to be included in the ordinary organization of educational institutions. Do you demand an industrial school? Then one is opened in some corner. Do you want a commercial school? Then one is put up in another corner. Are you keen on agriculture? Then they shove agriculture into another corner. This procedure is inefficient and uneconomical. Instead of opening a Commercial school, you recognise commerce as a part of the University course. Then it will attract more students, and it will be started in more centres. As the *London Times* has well observed, Universities no longer live in a heaven of their own, lifted high above the terrestrial sphere of technical education. It is now universally admitted that the highest kind of technical education should be of University rank, based on the same foundation of general education as is required for the pursuit of other studies. The duty of the Universities is at all cost, to insist on the maximum of general education as a foundation for specialisation within their own sphere. To reconcile this principle with the practical requirements of life and individual intellectual limitations in the Secondary and Elementary schools, to obtain the maximum of general education for those entering the lower grades of technical education is a task in which they can assist by their example and by leading the public which is ever ready to accept their guidance along the right line of educational policy. This implies, to quote Lord Haldane once more, that the Universities should take a large part in shaping the spirit and endeavour of the Secondary and Elementary schools, and as a condition of this, the entire organization of education should be shaped into a connected and comprehensive system. A University should not be an isolated body, but a body recognising among its activities the whole educational agencies in a country, coming under its

purview. Principal Hopkinson, distributing prizes some years ago at Macclesfield Grammar School, said: He, for one, felt it was impossible to carry on the work in the Universities with anything like success unless they were in close relationship with secondary schools. They wanted their Universities to be influenced by the experience and knowledge of those who had been directly engaged in secondary education, in training the boys some of whom would pass on to the Universities; and on the other hand the Universities would be glad if they could exert an influence on the secondary schools, whose methods had to be tested by the work their students did in the Universities. He thought sometimes the Universities might give valuable hints to the secondary schools on the subject of teaching and preparing for the Universities.

It is high time a University was established in Travancore, and the Government of H. H. the Maharaja have appointed a Committee. The Report of the Committee will be ready by the end of the year. But they need not be in a hurry, and can in a recipient mood await the publication of the Report of the Sadler Commission. I shall conclude with the noble words which Sir Oliver Lodge addressed to the Professors, students and citizens of Birmingham on 28th November 1900, the date of their first meeting as a complete University, the earliest University of the new type, and with apologies to him: "The world looks to us to become a great and pioneer University, not clogged by tradition, nor yet hampered by too immediately utilitarian views. We stand for the education of the future. Travancore is awakening to the need for higher education in every rank of life. The educative future of the English-speaking communities is dependent on our action, which will be imitated in many a part of the Empire."

INDUSTRIAL DEVELOPMENT IN INDIA DURING THE WAR.*

BY D. T. CHADWICK.

IT is a well-known truism to say that India is primarily an agricultural country. Except for the large cotton, jute and coal interests, industries in India in the early years of this century were either confined to a few factories or were still continuing on a village scale. Thus in the year before the war in the sixteen principal articles of export, of a total value of 150 millions, only two classes of manufactured goods figure, *viz.*, cotton and jute. On the other side, except for sugar, the principal imports consisted solely of metals and manufactured goods, among which cotton and iron or steel goods took leading places. It was thus not surprising that on the outbreak of war the first economic anxiety centred round the difficulties of getting agricultural produce sold, for though most of the crops were sown, it seemed that by the time they came to harvest, markets would be either non-existent or very restricted. For some articles these forecasts proved true. Difficulties have continued and in some cases become more intensified; yet on the whole this stage soon passed as it became clear that many of India's raw products were essential for the prosecution of the war, as for instance jute, wheat, wolfram, lac, mica, castor seed, hides, etc. The first phase of the second stage supervened, *viz.*, the need for a greater and more varied industrial output from India. The causes which called for this effort are still acting, some with increased force. They are briefly the need of supplying from India, as far as possible, many of the requirements of the armies operating in the

* This paper was read by Mr. D. T. Chadwick, Indian Trade Commissioner, at the British Scientific Products Exhibition, King's College, London, on September 4.

East, and the necessity of meeting local wants for which the ordinary sources of supply were cut off either through lack of shipping or through being otherwise engaged. The industrial effort thus called for has taken three forms: (1) the establishment of new factories or the expansion of existing ones; (2) the organization of such industrial resources as India possessed, and (3) the closer examination of local resources in the search for substitutes and new commodities, etc.

PRE-WAR ENTERPRISES.

Even before the call for widespread organised industrial effort was made, the larger factories in India had contributed most helpfully to Army supplies. The jute mills of Calcutta supplied necessary sandbags and yards of sacking by the million, whilst almost from the outset of war Indian cotton mills met the needs of khaki cloth, etc., for the ever-increasing armies in the East, which for khaki cloth alone now runs to over 20 million yards a year. In the first half of 1915 the railway workshops, as well as those of the principal engineering firms in Calcutta and Rangoon, undertook to supply shell cases to supplement the output in the United Kingdom. And this continued until the Ministry of Munitions in England had so developed its own organisation as to be independent of any supplies from India. It was fortunate at that time of anxiety that India could to some extent help. But it was only just possible. The steel used, which had to be according to United Kingdom specification, was all supplied by the Tata Iron and Steel Company, and was of such quality that not a single shell was rejected at gun proof for defective steel. Yet these steel works were only just erected in time. The first steel ingot at these mills was only rolled in February, 1912, and the first rails a month later—i.e., a little over two years before the outbreak of war. And some time is always needed for a steel factory to settle down to work, especially

when it is the first of its kind in a country, and all labour has either to be imported or trained, and still more when, in addition, the whole site of the works, mines, etc., was tropical, and practically uninhabited jungle only four years previously. The utility of these steel works did not cease with the provision of steel for shell cases. They have been the chief source of supply of rails for Mesopotamia and Africa. Extensions of the works have been undertaken, and a rolling mill is being erected which will give steel plates of any length and up to 90 ins. in width. A supply of such plates obviously opens a large vista of future possible developments. In addition, the Bengal Iron Company has helped largely, and now another iron and steel company has been formed under strong auspices to develop other large iron deposits. Without these steel works India's contribution of finished material to the armies in many parts must have been very much less than it has been, and the burden would then have been thrown on this country.

WORK OF THE MUNITIONS BOARD.

The cases so far quoted relate to large firms in existence when war started. But as time went on more widely co-ordinated efforts were needed to supply as far as possible those essential articles required by the armies and civil population, the import of which was cut off either through inability of supply or through lack of tonnage. For this purpose the Indian Munitions Board, under the able control of Sir Thomas Holland, was started in April, 1917. It was clearly a great undertaking to attempt to organise industry in wartime in a country of a population of 315 millions, of which over 70 per cent were normally engaged in agriculture, and in which there are at least twenty-three different languages, each of which is spoken by more than a million people. It was impossible to make India self-supporting in manufactured goods in the time, and no such visionary ideals were

entertained. But very much more has been achieved alike in quantity, quality and variety than three years ago seemed possible. This result has been largely due to the wholehearted and ready co-operation and help which the business community in India of all classes and grades has given to the Munitions Board. As one instance of the speeding up which has resulted from such co-operation, it may be said that the Karachi Committee took about six weeks to convert a vacant tract of foreshore into a village with workshops, workmen's houses, etc., complete for the re-erection of sectional barges. And whilst at first nineteen days were required for the re-erection and launching of one barge, some few months later they were rarely turned out at a rate of less than four a week, and at times a speed of six a week was obtained.

TANNING AND MEDICAL STORES.

For tanning materials efforts have proceeded on three main lines:—(1) Encouraging the cultivation by special concessions of cassia auriculata, the favourite tanning reagent in Madras. (2) The preparation of tanning extracts, especially of myrabolams, for hitherto the raw fruit has been exported and not the extract. (3) The systematic inquiry and testing at the factory at Maihar of numerous other tanning reagents and combinations thereof. These form a very important line of inquiry, as India has a very large output of hides. The undue weighting of hides and damage by faulty flaying have often proved a heavy handicap to Indian kips. It cannot be pretended that these difficulties have been entirely or effectively surmounted, but all reports tend to show that a considerable improvement has occurred owing to control and the need of working to high Army specifications. Concurrently there has been a large increase in the output of leather goods of all kinds, many of which had not hitherto been made in any quantity in India, from the many articles of military equipment to leather

belting and pickers for cotton mills. The Cawnpore leather factories are among the best known in India, but others are being erected with modern equipment, especially round Calcutta.

In an entirely different category come a large variety of medical stores and surgical requirements. The glass works of the North have been able to make satisfactory Petri dishes, glass tubings, and flasks, whilst attached to the medical store depôt at Bombay is a private concern employing some hundred of workmen in the manufacture of artificial limbs of the approved modern type. Very similar progress has been made with drugs.

FORESTRY.

The realm of forestry is one which has come in for searching examination during this period. In spite of a forest area of over 250,000 square miles, imports of timber into India exceeded exports by some twenty to thirty thousand tons a year before the war, excluding firewood, railway sleepers and ornamental woods. These imports consisted largely of teak, hard woods and pine. In one instance even wood was imported from Siam, when exactly the same was available locally and at a lower price. This extensive employment of imported timber has been ascribed to a general want of sufficiently precise information regarding the timber resources of India. This defect could not be remedied in a day; but the present vital need of developing local resources has drawn great attention to it. Timbers have been found locally which even meet the high specification required for aircraft, though for this use the specific gravity requirements are defined within such narrow limits as to restrict the range of choice. These have now to undergo searching practical test. Two timbers are also being tested practically, as they are expected to prove suitable for rifle manufacture, whilst in the lower categories much of the imported pine and fir could be replaced in ordinary scantling sizes by the pine

and fir of the Himalayas. A substitute even for Oregon pine is available, if improved engineering facilities are afforded. Meanwhile, stocks of timber cut to sizes have been accumulated in various ports, and the Indian Munitions Board, since its inception, have sent overseas for Army purposes more than twice as much Indian timber as was ever exported in time of peace. (The Forest branch, Mr. Chadwick went on to say, also concerned itself with the preservation of bamboos and woods, and the resin, turpentine, and sandal-wood industries.)

RAW MATERIALS.

In the range of metals the importance of the Indian deposits of mica, wolfram and chrome are well known, and the workings of these have all been extended. The opening of the large Bawdwin deposits by the Burma Corporation should supply large quantities of lead, silver, zinc concentrates and copper. The output of this Burma pig lead, which is of high quality, already equals approximately India's pre-war needs. Tin deposits have very recently been reported from the Thaton district near Amherst, in Burma. With the iron and coal resources of India now being actively opened out, and with non-ferrous minerals also being commercially worked, there are better prospects than have hitherto existed of India having available those metallurgical resources which are vital to all industrial development and which hitherto she has lacked. The manufacture of the alloys of iron has begun with that of ferro-manganese. A set of electric furnaces are also being erected at Sakchi, primarily for refined steel for springs, tools and other purposes, but should occasion demand these also will be devoted to making other ferro alloys—*e.g.*, ferro-chrome, ferro-tungsten, etc.

Furnaces, works and factories cannot, however, be built cheaply without local supplies of structural and refractory materials. Structural steel is now available in

considerable quantity, and will be forthcoming in the future still more largely; the local production of cement of British standard quality was before the war only some 5,000 tons; the capacity of the present works is nearer 70,000 tons a year, and further developments are certain. Among refractory materials a beginning has been made with silica bricks, claimed to be equal in quality with those of England or Japan, and large quantities of these will be needed. The magnesite deposits in the Madras Presidency are of high purity. The manufacture of magnesite bricks is sure to follow. Though Indian asbestos appears totally unfit for textile purposes where flexibility is of great account, it may yet prove suitable for boiler lagging and fireproof compositions. Thus some of the first steps for developing locally the metallic resources of the country have been taken.

THE AID OF CHEMISTRY.

But this is an age not of iron alone, but of iron and chemistry. And perhaps it is in regard to the supply of some of the primary chemicals and in the solving of chemical problems connected with Indian industry that some of the greatest difficulties for advancement lie. One of the first difficulties is to ensure an adequate supply of cheap sulphuric acid of which at present the local production is small, though this should become possible, if the Burma zinc concentrates are smelted in Bengal.

Another basal chemical which is not yet produced satisfactorily locally is caustic soda. Among ammonium salts sulphate of ammonia is obtained at present chiefly as a by-product from the coke ovens. When one turns to the large number of derivatives from coal tar one is met by the unfortunate fact that the yield of tar and acid constituents from Indian coal is as a rule low, only being 2.1 per cent, as compared with 4 per cent in Great Britain. The possibility of developing local resources for aluminium and calcium carbide, cyanide, etc., turns on the

supply of cheap electric power from the waterfalls of India. Electric power has already been supplied successfully to industry in India on a limited scale. The two best known cases are those of the Cauvery Falls in Mysore, chiefly to supply power to the Kolar goldfields, and the more recent Tata hydro-electric scheme for supplying Bombay. In the first of these the capacity of the power-house at present is 22,650 electric horse power, and in the second 100,000. Both are being extended. But for these basal chemical and metallurgical industries still cheaper sources of power are required, and the Tata interests have investigated a proposal for throwing a dam across the Koyna river in the Western Ghats, whence 300,000 horse power per hour will be obtainable throughout the year.

Apart, however, from these chemical industries, the inception of which depends on the existence of cheap power, there is a large number of chemical problems associated with industry in India waiting solution. One of the activities of the Munitions Board has been to "mobilise" the chemists at present in India and allocate to them specific problems for solution. After enumerating some of the items of research allotted to different chemists, Mr. Chadwick continued; The war caused a great and sudden revival of interest in indigo. This opportunity has not been treated as a mere chance for recovering some earlier losses; it has also been utilised for serious organisation and definite research work, in which the Behar planters, the Government of India, and a strong scientific and business committee in England, in which Professor Armstrong takes an active part, are all co-operating with the double object of increasing the out-turn of indigo per acre and also of putting the final product on the market in the form of standardised paste.

It may seem strange, when speaking of a land of rice and wheat, to allude to new foodstuffs. But the exigencies of war have

turned attention in India, as elsewhere, to food. Samples of malted foods from Indian cereals have been prepared, and from Bombay comes the report of a purified groundnut flour of considerable nutritive value, and not dissimilar from the cotton-seed flour, which, in this country, has been recommended as a suitable diluent for wheat. Indications seem to point to the likelihood of testing thoroughly the possibility of jam-making in certain parts of India.

In this brief summary an effort has been made to sketch some of the main outlines of the new industrial developments in India during the later years of the war. The largest contributions in material goods have naturally been made by the large and varied textile industries extending over a wide range of articles, from khaki cloth and pugarees to blankets and coir screening. And to supplement the efforts of the mills many of the hand-loom weavers have been employed on tasks within their capacity. The feasibility of employing the old indigenous craftsmen of India has thus not been neglected, though obviously it is more difficult to ensure working to specification by them than by the large mills. The mere enumeration of the articles made in these various branches of textiles would exhaust all the time allotted for this lecture. So it has been deemed preferable to concentrate attention on what are, perhaps, the less widely known industrial efforts in India, and to mention some of the difficulties they have had to meet. Frequently work has had to be done with makeshift apparatus and machinery, and it must not be supposed that every effort mentioned in this lecture will ultimately blossom into a large successful industry. Some wreckage there is bound to be when the period of transition comes. In endeavouring to summarise in thirty minutes a wide field of endeavour and activity it is difficult to avoid causing perhaps a too roseate impression of progress. Anyone who knows India realises that there are difficulties ahead when

full competition again becomes operative, but some solid progress has been made; and I hope that this brief sketch does show that there is a wakening spirit abroad to industrial possibilities in India, and also that there is a strong hope of effectively widening the basis of Industrial employment in India.

This is not a full account of India's economic effort during the war. —That obviously can not be given yet. We do not yet know how far we may be led. In fact cables received last week show that another phase is opening, with the orders to make standard cotton cloths at controlled prices—the counterpart to the standard suits of England. The repercussions of this war are world-wide, and the problems to which it gives rise present in most countries certain broad lines of similarity, though the conditions in which solutions for such problems have to be sought are widely different. Finally, I wish to repeat and emphasize that this lecture is merely a *summary of some of the main lines* of Indian industry during the war; it is in no sense an economic survey of India in war time. As in every other country, some have made great profits; other large classes have suffered loss. There is such widespread talk nowadays of raw materials that the impression easily grows that there must be unlimited markets for all India's raw produce. Such is not the case. Difficulties of transport and finance weigh as heavily on India as on other countries. For instance, the area under cultivation of such a war commodity as jute has decreased since peace time, whilst the markets for some other crops have greatly shrunk. As elsewhere, some in India have lost, some have gained, by the economic dislocation caused by war. How the balance will come out in the end remains for future study to disclose.

ECONOMICS IN THE WEST.

India's Industrial Future.

London, 10th July, 1918.—In quarters in which an intelligent interest is taken in Indian subjects much satisfaction is felt that the Montagu report gives prominence to the question of India's industrial future. Some perhaps, are just a little disappointed that an even more conspicuous place was not found for the economical aspect of reform. On the whole, however, everyone realises that we have, as this report shows, advanced in the past few years a very long way from the old *laissez faire* attitude with its complacent acquiescence in the practical sterilisation of India's industrial forces. It will be for people in India to see that this aspect of the subject is kept well to the front in the coming days of controversy and change. There is, I am afraid, a real danger that economics may be neglected in the discussion of the purely political phases of the problem. There will be intense agitation about the character of the franchise and only a very moderate interest in what is infinitely more important—how can machinery of Government be most effectively framed for developing the enormous resources of India and giving her the position she is rightfully entitled to occupy amongst the great manufacturing countries of the world. It will probably not be remembered that the surest preparation for self-government has always been a strong development of the economic activities of a nation. Great Britain did not attain to full political status until she had established herself as a great manufacturing power. It was much the same with France. Germany seems to supply evidence of a contrary kind. But that is not the case, for it was not until the German Empire had been called into being and the old system of petty states had been abandoned that the remarkable growth of German industries and commerce

commenced. In fact, the old adage that trade follows the flag is supremely true if we interpret both phrases broadly. India's flag is or should be her progressive and peaceful development on lines which will eventually lead her to a completely self-governing position within the Empire. If this is duly hoisted and kept flying, there need be no fear that her manufactures and trade will not grow in sympathy under its shadow.

Sir S. P. Sinha, I note, has just emphasised this point of the importance of industrial development in some comments he allowed to be published on Monday last. "To my mind," he said, "the reforms are of value in the degree and to the extent that they tend to the development of the country and the most important phase of development needed is industrial. It will be to the advantage not only of India, but of the Empire as a whole from all points of view—military, social, political and economic—to press forward the industrial organization stimulated by the war." "I cannot," he remarked in conclusion, "lay too much stress on considerations of such vital import to India and the Empire." These are the words of a true patriot who sees that the true road of advancement is not a policy of crying for the moon but of one which will really strengthen his country morally and enrich her materially. The emphasis laid by the Indian member of the Imperial Council on the desirability of utilising in times of peace the industrial organization stimulated by the war is wise and timely. It will be by the use made of the splendid and costly machinery involved by the war that in India as in Great Britain the trade position after the war will be established. There should be no difficulty as far as India is concerned, in enormously developing the steel industry on existing lines. Many lesser forms of manufacturing activity involved in war production should also profit. But the fairest opening for new enterprise to my mind will be in the building up on the existing foundations of a

great ship-building industry. For a good many years after the conclusion of peace there will be a demand for new tonnage which the ship-building yards in Europe and America will be unable to satisfy. India will thus have her chance of receiving in a modern form the glories of her old ship construction which was once, under the direction of the famous Wadia family of Bombay, the admiration of the world. The old drawback of lack of material will no longer operate. With ample supplies of steel on the spot and abundant power generated by her matchless resources of water she will be in the best position to enter into rivalry with the older sources of modern ship-building for the supply at least of the smaller classes of ships. The supply of efficient skilled labour will at first be a difficulty but as the experience of the steel works recently established shows, Indians are apt learners and there is no reason to fear that given the proper educational training facilities there will be any real lack of artisans when the call comes for them.

IMPROVING OLDER INDUSTRIES.

Associated with the question of developing manufactures which have directly ministered to war needs is the equally important need of improving by making more scientifically efficient older industries. The production of Indigo supplies a leading example in this direction. Until the discovery of synthetic Indigo the Indian Indigo trade was supreme, but the artificial product by its superior cheapness was a rival which was not to be overcome on the old lines and there was a real danger at one time of the once powerful and profitable industry being totally submerged. Then the war came and gave a new fillip to the production of natural indigo and in recent times the industry has enjoyed a spell of prosperity such as it has seldom experienced in the course of its long history. The question is whether the position it has secured as a result of the world cataclysm can be maintained in the

days of peace when the artificial product will again be competing in the market. For a reply to this question we may profitably turn to an interesting letter contributed by Professor H. E. Armstrong to the *Times*. Professor Armstrong, who needs no introduction in India, makes an interesting survey of the position as it exists at the present time after the series of experiments conducted under the auspices of the Indigo Committee. At the outset he recalls a statement he made when in Calcutta in November 1914, that if one-tenth of the zeal put by the Germans into the production of the artificial pigment were brought to bear on the problem of producing natural indigo in a cheap and satisfactory form, the future of the industry would be assured. He then details the measures taken to improve indigo production with Mr. W. A. Davis, a former pupil of his own directing the experiments in India. In the first instance Mr. Davis succeeded in producing a paste comparable with that put upon the market by the Germans, and several casks of the paste were sent to Europe. But "obviously it is undesirable to send water about the world if dry materials are available," and efforts were then directed to the production of the dye-stuff in a dry form that could be more easily dealt with than the hitherto customary hard cake and of definite strength. We have Professor Armstrong's satisfactory assurance that "such progress has been made that it is hoped that this will eventually be accomplished." "The reduction of paste here," he says, "was found to be less troublesome than had been supposed. Indigo dyers all over the country have had the opportunity of testing the product and are agreed that although it cannot be used for light shades, as the impurities lessen the brilliancy of tone, it is even superior to the synthetic material for heavy shades. In one case, in fact, five and one half parts of the natural paste have been found in practice, on a true dye works scale to give an intensity of colour reached

only by the use of eight parts of synthetic indigo tin. The substances present with the indigo tin exercise a definite influence to the good. A considerable quantity of paste is now on offer to dyers at the price of the synthetic product of the same indigotin content." As to the future Professor Armstrong has some instructive words which it may be hoped will be weighed well by those whom they most concern. "The recovery of the Indian industry," he says, "will probably depend far more on agricultural developments than on more improvements in the manufacture, though it is clear that these may be considerable. Unfortunately, the indigo lands have been largely exhausted and are now suffering, it seems, from lack of phosphates. If phosphates can be supplied in sufficient quantity there is good reason to suppose that good crops will again be obtained; these fertilisers, however, are now costly and difficult to procure. Trustworthy estimates seem to show that, given proper art fields, indigo can be made and sold at prices at which the competition of synthetic indigo need no longer be feared." Altogether, Professor Armstrong's conclusions are highly encouraging. If the Indigo planters had taken to heart the warnings he gave in 1901 as to the necessity of more scientific methods in indigo production, they would never probably have had to face the fierce competition of the synthetic article. But they allowed the chance to slip with the results only too well known. Now they are completely wide awake, or should be, and we may reasonably hope that they will put their house in order against the time not far distant when synthetic indigo is once more to the front in the world's markets.

THE AIR INVENTIONS COMMITTEE.

In the past four years under the stimulus of the war there has probably been a greater fertility of invention than at any previous period of the world's history. We shall have to wait until the declaration of peace before

the full tale of this wonderful exercising of the human mind can be told. Meanwhile, a slight corner of the veil is lifted in a report which has just seen the light illustrative of the activities of the Air Inventions Committee, now a part of the Air Ministry. Although only formed six months since over 5,000 inventions and suggestions have been examined. We are not told what the successful inventions were, doubtless for good and sufficient reasons, but as examples of how not to do things for prospective inventors we are given some samples of the ideas laid before the Committee. More assuring even than these are the notions which the Inventions Department of the Ministry of Munitions has been called upon to digest. Take the following suggestion for dealing with hostile aircraft as an example: "The clouds are to be frozen artificially and guns mounted on them: heavy guns are to be suspended from captive balloons: the moon is to be covered with a big black balloon: aeroplanes are to be armed with scissors or scythes, like Boadicea's chariot, or to trail bombs behind them on a long cord: heat rays are to be projected for the purpose of setting Zeppelins on fire: electric waves to paralyse the magnetos. One of the most popular suggestions of all is to attach a searchlight to an anti-aircraft gun, get the light on the object, and shoot along the beam: but, unfortunately, the path of a shell is quite different from that of a ray of light. Most elaborate "decoy" schemes are sometimes worked out for the confusion of the enemy, comprising in at least one case sham factories with chimneys and hooters complete. To prevent the polished lines of a railway showing at night, the last carriage of the last train, according to another correspondent was to *camouflage* them by dribbling blacking as it went along." Other weird suggestions were "a balloon carrying magnets hung on strings to attract the rifles out of men's hands; a shell with a man inside it to steer it to the target; the sending of snakes into enemy trenches by pneumatic

propulsion"; and "the throwing of live wire cables carrying a high voltage among advancing bodies of infantry by means of rockets." These foolish ideas must not be taken to be typical. They are doubtless the emanations of half-demented brains which are always excited in times of public effervescence. The true test of the originality of the time is to be found in the vast mass of new ideas which have been applied in the various operations of war and in the peaceful domain of commerce and industry under stress of war conditions. Here the progress marked in human achievement is simply marvellous. Happily much of it will survive the struggle to make smoother the path of humanity in days to come.

UTILISATION OF BY-PRODUCTS.

An interesting article in the last issue of the *Times Trade Supplement* draws attention to the increasing utilisation of the by-products of industry and more particularly to the extraction of oil from cotton seed for edible purposes. After describing the varieties of cotton seed the writer states that neither the Egyptian seed nor the Indian variety of seed lends itself readily to efficient decortication by the American method; and that consequently the British seed crusher has been practically compelled to crush whole such cotton seed as he has been able to obtain in commercial quantities at a suitable price. Steps taken in recent years to increase the cultivation of the American variety have, however, been very successful. If it had not been for the war, Uganda would probably now be producing 50,000 tons of such seed per year. During 1917, the equivalent of about 400,000 bales of 500 lbs. each of the American variety was grown in India. "Undoubtedly," proceeds the writer, "the most efficient method is to mill the cotton seed in the country of origin, but the development of the oil industry in India will be a far slower process than the increase in cultivation. British seed crushers, therefore, may look forward to woolly cotton seed becoming available in increasing quantities for many years to come." The products of cotton seed are oil and cake—the former some little time since chiefly used for the manufacture of soap and the latter devoted to the feeding of cattle. But of late an immense development has taken place in the treatment of cotton seed and now the woolly variety of cotton seed treated by the American

system yields the following important products:—

- (1) A *high-grade oil* which is easily refined to an edible oil admittedly unrivalled for the manufacture of the highest grade of margarine and compound lard, at a lower cost and with a smaller refining loss than British crude oil.
- (2) A *pure cake* consisting of the residue of the kernel only (and therefore free from the contamination of the shell and of the fibre adhering thereto), rich in albuminoids and fat, from which, moreover, can be prepared a flour in every way suitable for human consumption, and containing five times as much protein and fat as is found in wheat flour.
- (3) *Decorticated cotton-seed hulls*, which by means of a machine introduced during the last five years are now successfully separated into their component parts of shell-bran and short cotton fibre, the former being employed in the manufacture of mixed feeds for cattle, the latter for making explosives, papers, etc.

Probably the most interesting outcome of this new system is the production from cotton seed of a flour of high nutritive value. According to a report which has been published analyses by the authorities in the United States show that cotton seed flour contains upwards of 60 per cent of protein and fat as compared with 11 per cent to 13 per cent in wheat flour. It is considered that cotton seed flour may be used with advantage in a mixture with wheat flour up to 20 per cent. There is, therefore, a highly important place for cotton cultivation in tropical economy not only for its value as a contributor to textile manufacture but for the support it gives to the vital matter of food supplies. In India no doubt the subject of increased cotton production is being kept steadily in view. But it should be realised that the possibilities of the trade are so great that nothing short of a systematic development of resources as much on the manufacturing as on the agricultural side, will serve the ultimate needs of the country.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Running a Power Plant on Wood Shavings.

Washington, D.C., U.S.A., 14th August 1918.—An American power plant having an extensive business is using wood shavings from a near-by wagon-spoke factory for fuel. As the factory is about 2,000 feet from the power house it was at first considered advisable to convey the shavings to the plant by means of a pipe line equipped with blowers. However, it was found impossible to do this on account of the character of the shavings, which were of the long hard-wood type. The shavings therefore have to be hauled to the plant by wagons and are dumped into a storage shed. A flight conveyor carries the shavings to the boiler room and drops them into conveyor pipes which lead to the furnaces. Shavings swept past the pipe openings are caught by a chute and dropped into a cage mounted on a wheelbarrow. They are then wheeled back to the storage shed at frequent intervals. In order to fire the shavings in combination with coal the furnaces, which formerly burned coal alone, had to be redesigned. It was decided after quite a little consideration to extend the furnace fronts to give a Dutch oven effect. When the furnace fronts were extended it was possible for the conveyor tubes to drop the shavings directly over the middle of the fires. It has been observed that the efficiency with shavings is greater than that with coal alone, because coal can not be thrown far enough back into the furnace to give the best results. Under the present method of operation coal is shovelled into the furnace in conjunction with the shavings, as the supply of shavings varies with the output of the wagon-spoke factory.

POLISHING FLOORS WITH ELECTRICAL MUSCLES.

With the harnessing of electricity much of the hard work connected with polishing of any kind has been abolished forever. In the matter of hardwood or linoleum waxed floors, for instance, there is now available an electrical machine which does the work in the minimum of time and with no more labor than that necessary to push it over the surface.

Originally, the electric floor polishing machine was designed for the large telephone building in New York City, and through the use of this machine the owners of the large office building were able to replace men with women and girls since great muscular effort was no longer required. It was long ago demonstrated that polished floors, if kept bright and clean, are much more sanitary than floors subject to mopping and scrubbing. Furthermore, polished floors are much less expensive to care for, and it is largely for that reason that they are being more and more employed in office buildings and large public structures.

The polishing machine referred to weighs about one hundred pounds. It is mounted on rollers, and by means of the long, carriage-like handle it can be readily pushed about. The polisher proper consists of a cylindrical brush driven at high speed by a one-quarter horse-power electric motor. The brush is made of two semi-circular aluminum cylinders, mounted upon a drum of the same material, revolving in ball bearings. Cylinders and motor are connected by a chain and sprocket wheel. The brush is set to revolve at right angles to the plane of the floor, giving a buffing action that reduces the amount of wax required.

SAVING GRAIN IN THRESHING.

The United States food administration has demonstrated that three bushels of grain are lost in every 100 bushels threshed, because of careless methods in handling the grain, and that this amount can be saved

if the farmers of the country will follow certain simple suggestions which have been put forth. If this is done, and figuring on a crop of 800,000,000 bushels of wheat this year, which government reports indicate is more than probable, 24,000,000 bushels of wheat, worth (at \$2'20 a bushel) the huge sum of \$54,000,000 will be saved to the country. The saving on oats and other small grains will be in proportion.

In order to impress upon the farmers the necessity of employing more careful methods in threshing the food administration has created a grain-threshing division, under a thoroughly experienced head, and has entered upon a campaign which is expected to bring about the desired result. It is proposed to carry on educational work among farmers through the medium of committees which are to be established in each county. These committees will be composed of the county food administrator, county agricultural agent and a retired thresherman representing the local council of defense.

Agriculturists, threshing machine men and others with an intimate knowledge of the subject, while readily admitting that there is a big waste in threshing operations, ask how much of this waste can be saved, and in what manner it can be accomplished. In answer to this the food administration gives the following details:—

One and a half bushels in each hundred can be saved by having all threshing machines go into harvest in excellent repair, with ample power, and by seeing that during harvest they are sufficiently adjusted to meet varying conditions, so that a minimum of grain is blown into the straw piles. One bushel per hundred is conserved by having all machines in such repair that very little grain leaks under and around them on to the ground, and if what does leak out in this manner and is otherwise scattered about the machine, is cleaned and threshed before the machine leaves the

field. Finally, three-quarters of a bushel is to be rescued from waste by careful handling of bundles from the shock to the machine or stack, and by arranging the bundle wagons so that all grain that shatters therein shall be caught and saved. In connection with the latter it is suggested that bottoms of wagons be made tight or that canvas sides be provided if necessary.

The percentage of wheat which has been lost in the past by being distributed upon the ground or into straw piles to be fed later to animals on the farm is a very considerable one, but farmers as a rule have overlooked leakages with the excuse that the stock would get the benefit when they were turned in. The food administration is anxious to discourage this practice, especially at this time.

Many reports have come into Washington of straw piles appearing green with sprouted grain. In some sections of the west threshing outfits made it a profitable practice last year to follow other threshing outfits, purchase the straw and re-thresh. Instances of 3 to 7 per cent savings by this re-threshing have been common.

The importance of having all machinery in perfect shape for threshing can not be overestimated. This includes keeping the threshing cylinder up to speed; keeping all teeth sharp and straight; seeing that pulleys and belts are capable of delivering sufficient power, with a safe margin of excess, to keep the separator up to the required speed; making proper adjustment of concaves and other parts of the separator, and arranging that extra supplies and repair parts are on hand.

A JACK THAT WILL ALWAYS TAKE HOLD.

In an emergency it sometimes happens that an automobilist has to use his jack on ground which, because of its softness, or other peculiarity, makes a large base desirable if not actually necessary. But in the majority of cases an abnormally large base

would be merely a nuisance; no one wants to be permanently burdened with a jack that takes up as much space as a dining room table, just because once in a great while such a tool would come in handy.

The obvious answer to this double demand is a jack with an adjustable base. This of itself is hardly a practicable suggestion; but there is no reason why we can not have a jack with a supplementary base. In fact, we actually have such a jack now. When the regular base attached permanently to the jack is not adequate for the job in hand, the additional foot-piece is put in position beneath the regular one and clamped in place by the turn of a screw. The autoist has then a jack with a sufficiently large base to get him out of any difficulty in which he can well expect to find himself. And when he is safely out his supplementary base is flat and can be packed away against the bottom or side of his tool compartment without occupying any great amount of space.

SANITARY CAN AND SEALING MACHINE.

A new can for putting up fruit and vegetables will be appreciated by the housewife who likes to have her table look pretty. Fruits and vegetables can be packed in a can just devised without cutting, such as, large tomatoes and peaches that would not go into the old-style cans. The can is open entirely so that the packer can see just how the can is being filled and can arrange the fruit to the best advantage.

A sealing outfit goes with these cans which quickly and easily closes the cans without the uses of solder. The entire cover is off when the can is received. It is full size and has a rim bent down to hook up under the flange of the top of the can body in a way that it forms a tight joint without the use of solder. The covers are lined with a gasket or preparation to make the joint doubly sure. The sealing operation is quite simple. The can when filled is placed on the can base of the sealer machine

which is grooved to fit the bottoms of different size cans. A lever below this base is turned to the right, raising the can against the sealing chuck and pressing the cover down tightly on the can. Another lever is turned which rotates the can and the sealing rolls are brought against the rim of the cover by turning a small hand wheel first one way and then another. The first roll curls the can cover up under the edge of the can body and bends the flange of the can body down into the bend of the cover. The second roll squeezes the seam tight so that it will sustain over twenty pounds of pressure. This makes an airtight joint.

PRACTICAL TESTS OF BUILDING MATERIALS.

Most of us work in buildings and live in them, so that interest in building materials may be taken for granted. Eversince our modern introduction to cement there have been many to theorize as to what happens when a concrete building, with or without reinforcement, is subjected to fire conditions. The questions involved are so important that the Bureau of Standards and the Underwriters' Laboratory have undertaken an elaborate series of full scale experiments which will show just how columns under stress behave when heated and quenched.

A series of standard columns has been prepared utilizing the different systems of reinforcements and different cement aggregates. A furnace where 2,300 degrees F. may be maintained was built with arrangements for applying pressure to the column under test and for training upon it hose streams while the heat is on. Columns may also be dropped from a height to observe what would happen if a building falls.

Results thus far indicate a difference of over 100 per cent in the resistance of cement aggregates to fire and a variation of from seventeen minutes to eight hours in the time columns will bear the same burden under fire conditions.

The results of this research involving chemistry, metallurgy and engineering should, when completed, prove reliable guide posts in future building operations.

AN ELECTRICAL ENGRAVER.

An engraving device which operates by electricity is now being placed on the market by a New-York concern. This engraving outfit makes use of two available range transformers enclosed in an oak case. The main set of wires leads to the copper electrode which does the engraving; a second set leads to a manually-controlled switch, located near the point of the pencil. In using this device the forefinger rests upon this switch, the switch remaining open while the writing or engraving is going on. When the operator wants to raise the pencil from the work he presses the switch with his finger and breaks the current to prevent flashing or arcing. The second set of wires is controlled by the small connecting switch on the pencil, runs back through the instrument board into the interior of the device. On one side dry cells are interposed to give a direct current for operating a circuit breaker fastened to the side of the cabinet. Writing with this device, say the makers, is as easy as writing in the usual way on paper with a pencil.

EXERTING AN EVEN PRESSURE ON IRREGULAR SURFACES.

What is claimed to be entirely new application of a mechanical principle has been recently made in the construction of an attachment for a vise by which the latter may be made to take a firm hold on all irregular surfaces and shapes. No matter what the lines of a piece of work may be equal pressure is exerted throughout its length and it is firmly secured in the jaws of a vise supplied with this equalizing device. This will save much time in shops where in order to handle irregular shapes the men are called upon to make blocks to equalize the pressure of the jaws so that

the piece may be held securely while being worked.

The mechanical principle may be likened to a number of round balls resting in a row, slightly off center. When the pressure is applied to the ball ends all of the others will move out of line in opposite directions. Thus by arranging a number of lugs in opposite directions, with curved contracts on a channel, these lugs will act as compensating wedges and force the gripping lugs to protrude from the channel and automatically equalize any pressure which may be applied.

The article to be held is placed in the vise and the jaws brought together and then a few turns of the exposed screw-heads of the device bring all the lugs in equal contact, after which a slight additional turn on the vise handle is given and the grip on the object is absolute. The principle involved in this invention has been applied to the "locking up" of printers' forms, and here it will also be the means of saving much time. The system now generally in vogue requires the workman to make several adjustments to each of many quoins before getting the forms locked up securely. The new method calls for manipulation at two points only and a tremendous pressure is distributed where required throughout the chase by screw pressure. It provides a straight edge next to the form which is always locked up perfectly true.

ALFRED T. MARKS.

Paper-making is being developed in Japan. In 1915 only 54,000 tons of pulp were imported. After the war it is expected that sufficient pulp will be manufactured in the country, and it is likely that when the pulp and paper business there is fully developed Japan will compete with the rest of the paper-making countries.

NOTES.

The following statement furnished by the Department of Statistics shows the quantity and value of the different kinds of timber, other than railway sleepers, imported by sea from foreign countries into the different maritime provinces of British India during August and September, 1918 :—

Imports during August, 1918.

Share of provinces	Deal and pine wood		Jarrah wood	
	Quantity	Value	Quantity	Value
1	2	3	4	5
	Cubic tons	Rs.	Cubic tons	Rs.
Bengal ...	194	32,448	...	...
Bombay ...	278	65,781	...	...
Sind ...	...	...	...	...
Madras ...	...	...	...	...
Burma ...	...	...	...	...
Total ...	472	98,229	...	...

Share of provinces	Teak wood		Other timber	
	Quantity	Value	Quantity	Value
1	2	3	4	5
	Cubic tons	Rs.	Cubic tons	Rs.
Bengal ...	46	10,049	43	3,898
Bombay ...	341	89,123	1,029	2,08,782
Sind ...	...	...	3	280
Madras ...	4	200	303	10,122
Burma ...	...	...	...	...
Total ...	391	99,372	1,378	2,23,082

Imports during September, 1918.

Share of provinces	Deal and pine wood		Jarrah wood	
	Quantity	Value	Quantity	Value
1	2	3	4	5
	Cubic tons	Rs.	Cubic tons	Rs.
Bengal ...	...	...	...	...
Bombay ...	476	1,20,733	...	...
Sind ...	...	...	...	...
Madras ...	...	...	...	...
Burma ...	...	...	...	...
Total ...	476	1,20,733	...	...

Share of provinces	Teak wood		Other timber	
	Quantity	Value	Quantity	Value
1	2	3	4	5
	Cubic tons	Rs.	Cubic tons	Rs.
Bengal ...	...	...	1,539	2,15,035
Bombay ...	25	8,213	1,242	2,03,829
Sind ...	...	...	2	780
Madras ...	2	450	283	7,503
Burma ...	...	...	62	4,765
Total ...	27	8,663	3,128	4,31,912

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The annual consumption of raw cotton in Japan amounts, says the *Board of Trade Journal*, to over 2,000,000 bales, 1,500,000 bales representing Indian cotton, 500,000 bales American cotton, and the rest Chinese and Egyptian cotton. Thus Japan entirely relies upon imports for her requirements in raw cotton, and, as already noted, the authorities have recently been considering ways and means of making this country self-supporting in raw cotton. The proposal according to investigations made by the Tokio Chamber of Commerce, is not possible of realisation. The Chamber has already drafted plans, which will be shortly referred to the official body which is charged with the task of making investigations with a view to promoting Japan's commercial and industrial development abroad. It is reported that the authorities contemplate cultivating raw cotton in the southern part of Corea and some parts of Formosa to the extent of about sixty per cent of the fibre in demand, which ranks in quality between Indian and American cotton. The remainder is to be obtained by increasing the cultivation of Chinese cotton by supplying Japanese capital.

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Writing in the *Indian Forester*, Mr. F. Sherfese, adviser in forestry in China, gives an interesting account of what has been done and what is intended towards the

establishment in China of a forest service under the Ministry of Agriculture and Commerce. He states that China has suffered and must continue to suffer, owing to the wholesale deforestation which took place centuries ago, and that it was not until the establishment of the Republic that the importance of forestry was recognised. To Mr. Chow-Tzuchi, recently Minister of Agriculture and Commerce, must be given the credit for the inauguration of a national forest service so recently as 1916. Among others, an English expert, trained at Kew, namely, Mr. William Purdom, serves as the chief of one of the six divisions into which the service has been organized. The general policy laid down is as follows: "To lessen the present scarcity and high price of timber fuel and other forest products by the afforestation of public lands unfit for agriculture and practically waste. To regulate streamflow by the planting of river sheds and catchment areas. To protect and manage on forest lines such public forest resources as still exist. To encourage private owners to plant by supplying advice and practical assistance. To conduct a vigorous pro-forestry propaganda throughout China, showing to all classes of people the need of forestry, what it means to the country, how it affects health and prosperity. To train young men to become foresters, and what are called inspecting forest nursery-men, whose duties will be chiefly the supervision of the initial work of forestry." It is also intended to instruct and interest school teachers in the principles and importance of forestry in order that they may impress upon the general student-body what it means to the country, and what the State is doing to foster it.

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According to the Government Resolution on the Annual Report on the working of Co-operative Societies in Assam for the year ending the 31st March, 1918, the number of co-operative societies rose during the year

from 344 to 352, and the working capital from Rs. 10,59,308 to Rs. 10,92,445, whilst the number of members decreased from 19,700 to 19,183. The reserve funds of central banks increased from Rs. 16,606 to Rs. 19,316, and those of agricultural and non-agricultural societies from Rs. 85,306 to Rs. 1,04,007 and from Rs. 16,239 to Rs. 19,166, respectively. It was realised some years ago that the arrangement by which the control of co-operative societies is combined under a single officer with that of the Excise Registration and a number of other departments was unsatisfactory, and as long ago as 1915 the appointment of a new officer as Registrar of Co-operative Societies and Director of Industries received the sanction of the Secretary of State. Financial restrictions consequent on the war rendered it impossible, however, till the current year, to provide funds either for the new appointment or for such increase of the subordinate staff of the department as would enable it to supervise efficiently any large expansion of the movement. In these circumstances Mr. Mackenzie was justified in the Chief Commissioner's opinion in the cautious policy followed by him in the matter of forming new societies. Funds have now been found for the new head of the department, and Mr. Beatson Bell trusts that a more forward policy will be practicable. Apart from the question of control, the conditions of the year under report were unfavourable in Assam to any considerable expansion of the movement on healthy lines. Money was unusually scarce, and the Registrar found great difficulty in financing the existing societies. Useful progress was made by a number of weavers' societies, and an interesting experiment was made in the formation of a co-operative store amongst the labour force of a tea garden. The most important problem facing the new Registrar is the organization of more satisfactory machinery for financing the societies. Reliance has been placed to a large extent in the past on

certain urban societies which had surplus funds at their disposal. These no longer adequately meet the demand. They are moreover worked primarily in the interest of individual shareholders, and they are consequently not a satisfactory source of capital for other societies. It will be for the Registrar to examine the question whether, as Mr. Mackenzie suggests, a provincial bank is desirable, or whether the difficulty can be met by the replacement of the urban societies as financing agents by central banks organized on sounder lines.

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Under existing banking regulations of Japan the minimum capital of a bank to be newly established in a town having a population of over 100,000 is fixed at 1,600,000 yen, and the minimum for a town of a population of under 100,000 is 500,000 yen. His Majesty's Commercial Attache at Tokio states that the Government has now revised the regulation so that no new bank can be established in a town with a population of over 100,000 unless it has a capital of 2,000,000 yen, though the minimum for towns with a smaller population has been left untouched. The revision has come into immediate operation. The reason for the revision is that there are too many small banks. According to the authorities, ordinary banks in Japan number no less than 1,400, which, they say, are too many and out of all proportion to the number of similar institutions in other countries. The existence of an unnecessarily large number of small banks is liable to produce various evils, which the authorities now propose to prevent by increasing the minimum capital of banks to be newly established in towns having a population of over 100,000. In a desire to prevent any unfavourable results that may be caused by a sudden change, the Government has left unchanged the minimum capital of banks to be established in towns having a population of under 100,000. The authorities, however,

aim at causing small banks to be amalgamated into large ones, both in small and large cities.

Mr. F. Dutton, superintendent of South African Railways, has written a paper on the above subject, says the *Engineer*. He divides the matter into two parts, a motor tractor and train following, and secondly, what he calls a loco-tractor. The latter forms a narrow-gauge railway (without a steam locomotive, the power being actuated by petrol through a pair of wheels) with the broad motor wheels behind the petrol motor. The wheels being lifted up, enable a narrow-gauge pair of flanged wheels to act in support of what the writer calls wheelways, which are on the outside of the rails. A trial trip has been made with rails of 16lb. per yard, grades 1 in 20, curves 50 ft. radius; no ballast except that furnished by the wheelways; sleepers 1,760 per mile; speed 18 miles per hour; rubber tires on wheelways 1,330lb. per ton, and on rails 344 lb. per ton; weight 5,655 lb. on the driving wheels, and 3,000 lb. on the rails. The estimate per mile was £320 for permanent way, £250 for earthwork, £50 for tracklaying, £150 for wheelways, total £770. The trial seems to have been a complete success. The report does not seem to give the gauge of the railway, but it is without doubt, the South African type of 3 ft. 6 in.

Trains of seventy-five ore-laden cars, each averaging at least sixty-eight tons, are not uncommon on the Butte, Anaconda and Pacific Railway, and there are now 262,400 volt direct current locomotives in use—those of the freight type weigh eighty-two tons each—as well as three tractor trucks of about half this weight. The electrical maintenance of all the locomotives and the tractor trucks is undertaken by two electricians and an assistant, who do all the re-winding of armatures and field coils, besides

attending to the car heating and lighting equipment, a feat that would hardly be possible on a steam system with so few men. The passenger locomotives are inspected electrically and mechanically every thirty to forty days. In actual practice not more than one hour per unit is required from each electrician at the period of inspection.

Regulations for the loan of sheep for the encouragement of sheep-breeding in Japan, in order to increase the wool supplies have been promulgated. A copy has been forwarded by H. M. Commercial Attache at Yokohama, and published in the *Board of Trade Journal*. Under these Regulations the following persons may borrow sheep for breeding purposes:—(a) persons owning five or more sheep; (b) two or more persons who own five or more sheep; (c) stock farming associations; (d) agricultural societies; (e) prefectural or country offices; (f) persons recognised as suitable by the Ministry of Agriculture and Commerce. 2. The term of loan shall not exceed three years, but may be extended in special cases. 3. Stock obtained from the ram so loaned shall be the property of the borrower. 4. Rams may not be sub-let without the permission of the Director of the station from which they were borrowed. 5. Borrowers are to pay all expenses for maintenance, etc. 6. In cases of sickness, etc., of the borrowed animals, the Director of the station from which they are borrowed is to be notified; in cases of death a veterinary surgeon's certificate is to be produced. 7. Reports are to be made by the end of June each year as to results obtained from borrowed stock. 8. Officials of the Department of Agriculture and Commerce may inspect animals on loan and give instructions regarding their care. 9. If instructions regarding the care of animals are disregarded, or their care neglected, the Minister of Agriculture and Commerce may order their return.

There has been always a well-founded reason against these sleepers, owing to their want of resiliency, notwithstanding their durability. Iron sleepers have been used in India and elsewhere in consequence of the scarcity or unsuitability of timber, but they have been condemned in rock cuttings and in broken stone, as against gravel ballast, where resiliency is noted. There is an article in the *Railway Gazette* of July 19th dealing with the general subject of railway construction as applied to reinforced-concrete sleepers. The article gives two well illustrated examples—the Meyrick and the Yoke patents—of doubled sleepers each on a separate rail, connected by occasional iron tie bars, where the want of resiliency has been counteracted by the interposition of felt and timber packing, these standing several tests. Australia and some parts of North and South America seem, owing to their abundant timber supplies, to be in no need of reinforced-concrete sleepers.

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Arrangements have been made between the College of Hawaii and the Sugar Planters' Experiment Station for the institution of a four year's course in Sugar Technology. This course includes general science as applied to agriculture, the agriculture of the sugar-cane under Hawaiian conditions, the chemistry of sugar, and the chemistry and engineering of sugar manufacture. Arrangements have been made for practical training in chemistry and engineering in factories while at work. The proposals follow closely those which have been successful at Audubon Park, Louisiana, and at the School of Agriculture, Mauritius.

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The Duke of Northumberland and Sir Gilbert-Parker have joined the Empire Resources Development Committee, whose membership now numbers 37. Three of the original members—Earl Grey, Sir Starr Jameson and Mr. H. J. C. Cust—have died, while four others—Mr. Walter Long, Lord Milner, Sir R. V. Vassar Smith and Sir G. Croydon Marks, M. P.—have resigned on grounds of ill-health, pressure of public engagements or acceptance of office under the government. Lord Queenborough is chairman. The committee advocates the development of the Empire's resources under such conditions as would give the State a share of the proceeds.

GLEANINGS.

Bulletin No. 84, just issued by the Agricultural Research Institute, Pusa, is entitled "The best means of rapidly increasing the outturns of Food Crops by methods within the power of the Agricultural Department." The material presented consists of notes submitted to the meeting of the Board of Agriculture in India held at Poona (1917), edited with an introduction, by Mr. J. Mackenna, C.I.E., I.C.S., Agricultural Adviser to the Government of India. According to Mr. Mackenna, the methods by which the produce of a country can be increased fall into two classes:—In the first place, the food supply of a country may be increased by substituting food crops for fibre or other non-food crops or by the breaking up of new lands formerly not under cultivation. These, however, are rather administrative questions dependent either upon the arbitrary order of Government that cropping should follow a certain scheme or on the availability of waste lands formerly uncultivated. The second group of methods which more properly come within the scope of Agricultural Department are:—(1) introduction of improved varieties, (2) manures, and (3) better cultivation. In the papers which appear in the Bulletin the efforts of the various Agricultural Departments along these lines are recorded. "It must be remembered" says Mr. Mackenna, "that there are considerable limitations to the use of manures. There are also limitations to extensive cultivation on account of the shortage of cattle, while it is probably dangerous to suggest revolutionary changes in well-established schemes of rotation. Advance along these lines must be gradual and the most hopeful prospect of a rapid development depends on the revolution of improved high yielding varieties of crops such as the

Pusa, Punjab and Central Provinces wheats and Bengal, Madras, Central Provinces and Burma paddies, combined with an effective organization for the rapid dissemination and distribution of these improved varieties."

Enquiries were recently undertaken by the Department of Statistics, India, regarding the sugar producing capacity of the sugar factories in India. Of the forty-six factories to which enquiries were addressed, returns from thirty were received. Of the remaining sixteen, six did not give any reply, six others were either closed or were not in working order, business was not started by two, one was opened only in August, and one was omitted as it produced only molasses. The results of the census show that the thirty factories turn out per day of twenty-two hours, 4,900 maunds (of 82½ lbs. each) of sugar from cane (first sugars), 2,100 maunds from cane (second sugars), 7,200 maunds from raw sugar, 3,600 maunds of molasses from cane, and 3,700 maunds from raw sugar, employing on an average 8,600 persons daily. The maximum amount of sugar that can be produced by these factories is, according to the returns furnished, 14,500 maunds (or 533 tons) per day.

A pioneer Portland cement factory for manufacturing British standard Portland cement has been completed at Jhajha, close to Madhupur on the E. I. Railway. The enterprise owes its origin to Mr. Davy, chemical expert of the Government Test House, Alipur, whose analyses of Jhajha shooting lime revealed an ideal composition for Portland cement. It is stated that the government has promised full support to the proprietor, Babu Satya Gopal De, and his young friend Mr. K. Chaudhury. It is interesting to note that this is one of the war industries started by an Indian, the prospects of which were at one time pooh-poohed by certain "experts." It is

understood that His Honor Sir Edward Gait is expected on a visit to the factory.

Graphite occurs in the Travancore State under geological conditions, similar to those of the richer deposits worked in Ceylon. The production in 1911 was 3,993 tons, the highest on record. Owing to the difficulties of working, the mine has been shut down since 1912. Some fifty-four tons of the mineral were obtained from the Vizagapatam mine in Madras in 1911. But no output has been recorded since 1912. Since the closing down of the Travancore mines attention has been paid to the graphite deposits in Bihar and Orissa and in Rajputana. At present the industry is only in its infancy.

There is to be a Bill introduced in the U.S.A. which aims at providing further revenue by taxing the circulations of publications. It is intended to grade the various kinds of circulations. For instance, a journal whose circulation through the post is more than 20,000 copies but less than 100,000 per issue, there would be a tax of a halfpenny for each annual subscription paid on those sent through the post.

It is stated that a new industry has been established in Australia, which is the treatment of a certain rock for conversion into wool. This rock contains fibrous elements and is a variety of asbestos. There is no reason, it is argued, why this mineral wool should not be used for making paper. If it became possible it would mean, as the material would be fireproof, that the paper would be imperishable.

A company has been formed with a capital of £450,000; with the object of building a mill in Zululand for the manufacture of pulp from papyrus grass.

MYSORE REPRESENTATIVE ASSEMBLY.

Address of the Dewan.

In opening the Dasara Session of the Representative Assembly on 17th October 1918, Sir M. Visvesvaraya, Dewan, said :—

GENTLEMEN,—We meet here, by His Highness' command, to exchange views on the work of the country in the thirty-fifth Dasara session of the Representative Assembly.

Before beginning the business of the session, it is my pleasing duty to echo the sentiments of this Assembly and to convey to His Highness the Maharaja our loyal and respectful greetings on his return to the State from an extended tour in Kashmir and the extreme north of India.

THE WAR.

We rejoice that the fortunes of the war have undergone a marked change during the past three months, as indicated by the gratifying successes on the Western front, the surrender of Bulgaria and the victories in Mesopotamia and Asia Minor. The situation is full of happy augury for an early and victorious peace.

As regards co-operation in war measures, His Highness the Maharaja's contribution towards the cost of the war has been increased to Rs. 70 lakhs. A sum of Rs. 65 lakhs out of the State balances has been invested in the first and second War Loans and the people of the State have separately contributed Rs. 36 lakhs more. Our Imperial Service Lancers and the Imperial Service Transport Corps are still at the front. They have seen service in Egypt, Mesopotamia and Palestine, and we have had the pleasure of receiving, from time to time, very favourable notices of their work. Last year the Imperial Service Lancers are reported to have taken a creditable part in the operations against Gaza.

In regard to recruits, we have not been able to supply more than 40 per cent of the number demanded. This is because, as I remarked before, soldiering has become a lost art in the country. But it is only a question of time for the people to get used to the profession and join the army in larger numbers. Strenuous efforts are being made and liberal inducements, including the grant of lands, are being offered in order to attract recruits. A high officer of Government has been placed on special duty to organise recruitment operations, and active propaganda work is in progress.

THE PRESENT SITUATION,

We are passing through anxious times. The war, the drought, the high prices of necessities of life,

the plague and the epidemic of influenza, which has recently spread into this part of the country, mark a distressing combination of calamities, which are pressing heavily on the population, and especially on the poorer classes.

The deficiency of food supplies is a common experience all the world over at the present time. The position in Mysore is intensified by the almost entire failure of the south-west monsoon. At one time the outlook seemed very gloomy, but a few heavy showers during the last and the current months have partially relieved the situation. The difficulties have arisen chiefly from panic, due to the withholding of stocks by the cultivators and attempts of profiteering on the part of the merchants.

Apprehending a shortage of food supplies, Government were obliged to bring under control the movement of the principal food grains. Maximum prices have been prescribed for the sale of ragi and rice in certain districts and depots have been opened, in the cities of Bangalore and Mysore, for sale at cost price. Several public-spirited citizens have also come forward to sell food grains at reasonable prices. These measures have had a salutary effect, but the situation, though well in hand, continues to cause anxiety.

Presumably, there are stocks of food grains in the country sufficient to last for some months to come and the ensuing harvest, however reduced or scanty, will add to our resources. What is required is that the existing food supplies should be properly conserved and distributed, and that producers, traders and consumers should realise the peculiar difficulties of the situation and work in a spirit of harmonious co-operation. The strong hand of Government must always be in evidence and continue to interfere whenever any section of the community tries to take advantage of the difficulties of the public.

The Past Year's Administration.

CENTRAL ADMINISTRATION.

The character of the administration is changing under the influence of new conditions. The increase of activities, the creation of new departments, the development of representative institutions and the situation created by the war, have multiplied the work of Government and rendered its functions more onerous and varied. The work of development is receiving increased attention and, judged by statistics alone, the volume of Government business has nearly doubled during the past seven years.

An Extra Member of Council has been appointed, the Secretariats have been reorganised and strengthened and the appointment of Chief Secretary has been revived in order to secure greater co-ordination of business. Special attention is being devoted to the recruitment of the services. Six Assistant Commissioners were appointed on the basis of the results of a competitive examination held in 1917, and six more were nominated from among members of backward communities. For the recruitment of the upper subordinate grades, 34 Probationers were selected during the year for the different departments.

One of the important measures undertaken in recent years is the codification of rules and procedure in the several branches of the administration. A system of office inspections by the Efficiency Audit staff has been introduced. A Statistical Branch has been newly organised in the Secretariat under a Director, for the purpose of consolidating and improving the agricultural, industrial, trade and administrative statistics of the State.

REPRESENTATIVE INSTITUTIONS.

As announced in the April session, the franchise of the Representative Assembly has been broadened and simplified. The Assembly has also been granted the privilege of interpellation. Arrangements are in progress to build a new Representative Assembly Hall which will provide better accommodation and various minor conveniences to the members. His Highness the Maharaja has graciously permitted its being named after him.

Altogether 426 subjects were brought up before this Assembly in the two sessions held in 1917-18. Of these, 244 have been disposed of and 182 are under consideration.

THE LEGISLATIVE COUNCIL.

The Legislative Council met thrice during the year and considered nineteen bills. Among the measures enacted were the Companies Regulation, the Transfer of Property Regulation, the Municipal (Amendment) Regulation and the Local Boards and Village Panchayats Regulation.

THE ECONOMIC CONFERENCE.

The Economic Conference met in Mysore for its annual session in June 1918. The chief work done was that of adapting the economic work of the State to changed conditions and the improvement of the organization. His Highness the Maharaja has been pleased to decide that the Economic Conference organization should be made permanent and the exact form to be given to the organization is under consideration. With the Legislative Council, the Representative Assembly and the Economic Conference, the State possesses a more or less

complete organization for the political and economic training of the people.

DISTRICT AND TALUK CONFERENCES.

Conferences were held in every district and taluk during the past year, and also in some *hoblis* on the people's own initiative, and agricultural, industrial and health exhibitions were arranged in connection with many of them. At present these conferences are organised by the joint exertions of officers and non-officials. There is, however, a growing tendency for non-official gentlemen to come forward and take the initiative. And, in course of time, these district and taluk conferences may be expected to develop into miniature Representative Assemblies for the respective areas and prove valuable adjuncts to local administration.

LOCAL SELF-GOVERNMENT.

Meanwhile, attention is being paid to the rapid development of the local self-government scheme. The necessary legislation has been passed and a special officer appointed to assist in its introduction. In order to reduce gradually the official element in municipal administration, the Bangalore City Municipal Council has been granted the privilege of electing its own President. Non-official Presidents have been appointed for the town municipal councils of Kolar and Chikmagalur and the office of Vice-President has been declared elective in the two cities of Bangalore and Mysore, and in twelve towns. In three more towns, non-official Vice-Presidents have been appointed by Government. In the Mysore City, non-official gentlemen have been appointed both on the Municipal Council and the Trust Board in the place of the official President-Chairman.

A programme of improvement works has been adopted for the Bangalore City, which includes the construction of a general market, a town hall and municipal offices and various other improvements and amenities. The cost is estimated at Rs. 13 lakhs, of which two-thirds will be borne by Government as a special case. Projects for laying out new extensions to the east of the Fort Centre Road in Bangalore City and near Vontikoppal in Mysore City, and also for the formation of industrial suburbs in both cities, have been sanctioned.

RURAL BOARDS.

The reorganization of rural boards is proceeding satisfactorily. Their revenues have been materially increased by the transfer to them of the *mohatarfa* tax and the items of local cess which constituted the Local Funds General. It is gratifying to note that, with the increase of resources, some of the District Boards are showing lively enterprise in

regard to the extension of railways and road communications. Village Panchayets under the new Regulation have been constituted for 842 villages and further work is proceeding.

FINANCES.

The revenue and expenditure for the year 1917-18 under service heads stood at Rs. 309.11 lakhs and Rs. 307.64 lakhs respectively, leaving a surplus of Rs. 1.47 lakhs. The capital outlay not chargeable to revenue aggregated Rs. 48.17 lakhs. For the current year, the budget estimates, as finally passed, provide for a revenue of Rs. 298.33 lakhs and an expenditure of Rs. 297.92 lakhs under service heads. The proposed capital outlay not chargeable to revenue is Rs. 93.13 lakhs.

On account of the disturbing conditions arising from the war, great caution has become necessary in the administration of our finances. Government, however, anticipate no difficulty this year in meeting from current revenues the whole of the expenditure provided in the budget, including the capital outlay.

REVENUE DEPARTMENTS.

The Land Revenue Department received considerable attention during the year. The prospects of Amildars have been improved and better arrangements made for recruitment and training. The taluk establishments have been reorganised and an improved scale of pay introduced at a total cost of Rs. 84,000 per annum. A separate school for the training of Shekdars has been sanctioned. Various minor improvements have been effected in the system of work in revenue offices. Orders have been passed for the transfer of 125,000 acres of Amrut Mahaj Kavals to the Revenue Department and steps are being taken to subdivide and make the lands available for cultivation.

The Civil Veterinary Department was reorganised in February 1918, in order to provide for the rapid extension of veterinary aid in rural parts.

EXCISE.

The excise revenue during the year amounted to over Rs. 65 lakhs as against Rs. 62 lakhs in 1916-17. With a view to reduce the consumption of intoxicants, 34 arrack and 346 toddy shops were closed during the year. The hours of sale have been further restricted and steps taken to remove shops located in prominent places. The issue of licenses for the sale of liquors during *jatras* has been discontinued. The principle of local option, which was introduced as an experimental measure, has worked satisfactorily and it is proposed to further extend it.

FORESTS.

In the Forest Department, the number of range charges has been increased and the pay of subordinates improved at an increased cost of Rs. 56,000

per annum. A school has been opened for the training of Rangers and other forest subordinates. A valuation survey of sandal-wood has been commenced in order to place the exploitation of this valuable product on a scientific basis. Experiments in forest industries such as, the manufacture of paper pulp, straw boards, pencils and matches continued to receive attention.

The Registration Department has been reorganised at an additional cost of Rs. 19,000 per annum.

PROTECTION AND MINOR DEPARTMENTS.

As announced in my speech at the last session, a scheme is being introduced for the separation of judicial and executive functions. A special officer has been appointed to assist in the introduction of the new arrangements, which will come into operation from the calendar year 1919 in the Districts of Bangalore and Shimoga.

The pay of the men and officers of the police force has been increased and provision made for the investigation of crimes by a higher class of officers than at present. The prospects of the clerical establishment of the department have also been improved. The scheme of reorganization, when fully brought into force, will involve an additional expenditure of more than Rs. 2 lakhs per annum.

MILITARY.

The rates of pay, allowances and pensions of the members of the military force are being improved. A scheme has been sanctioned for the grant of lands on concessionary terms as a reward for distinguished service. Scholarships and other facilities are being provided for the education of soldiers' children.

MEDICAL AND PUBLIC HEALTH.

The Medical Department has been reorganised and the pay of officers and subordinates increased, at an aggregate annual cost of Rs. 80,000. Recently, proposals have been sanctioned for encouraging ladies to enter the medical profession and for increasing the number of qualified midwives and nurses. The new buildings of the General Hospital at Mysore, now named the Sri Krishna-rajendra Hospital, were completed and brought into use towards the end of the year. The vaccination establishment of the Public Health Department has been reorganised. A better scale of pay is provided for vaccinators, and to ensure efficient supervision, nine Deputy Inspectors have been appointed.

HILL STATIONS.

The hill station of Nandi has grown in popularity, the number of visitors having doubled during the past three years. The improvement of Chamundi hill is proceeding. In view of the limited possibilities of Devarayadurga and Kalhattigiri, it is proposed to defer the schemes for the improvement of those stations.

TECHNICAL DEPARTMENTS.

The total expenditure on public works from all sources, including local funds and contributions, amounted to about Rs. 60½ lakhs. The Krishna-raja Sagara dam has been kept at a height of 63 feet at the centre to serve as a waste weir and it is raised in places up to a height of 103 feet on the flanks. Nearly the whole length of the low level channels has been excavated. The survey for the high level canal and estimates for its construction are nearing completion. The outlay on the works during the year amounted to Rs. 11¾ lakhs, which brought the total expenditure up to the end of June 1918 to Rs. 127¼ lakhs. Project subdivisions have been constituted to expedite the restoration of tanks. In connection with the improvement of irrigation facilities in the *malnad*, construction-work has been commenced on the *anicut* across the Bhadra in the Shimoga District which is estimated to cost Rs. 8½ lakhs.

The construction of the new Palace at Mysore has been put in hand. Building estimates aggregating nearly Rs. 2½ lakhs have been sanctioned in connection with the Mysore University and a sum of about Rs. 2 lakhs has been allotted for the construction of school houses throughout the State. An Architect's Division has been formed to deal with important building projects.

Particular attention was paid during the year to the repair of the more important roads. District Boards have been offered liberal assistance for the construction of new roads in the interior, wherever they are badly wanted. The bridge across the river Tungabhadra at Honnali is practically completed and will be opened for traffic very shortly.

ELECTRICAL.

The fifth installation of the Cauvery Power Scheme was completed during the year and the capacity of the generating station increased to 22,650 H. P. The remodelling of the Kolar transmission line has improved the supply of power to the gold mines.

RAILWAYS.

Our railway activities are progressing satisfactorily. In fulfilment of the conditions of the Branch Lines Agreement, the Government of India have been good enough to express their willingness to restore to the Mysore State the management of the Bangalore-Mysore, Mysore-Nanjangud and Birur-Shimoga sections. Steps have been taken to secure at an early date the transfer of these lines from the Madras and Southern Mahratta Railway Company. The Mysore-Arsikere Railway has added more than 100 miles to the open railways in the State. With the resumption of the lines referred to above, we

shall have a total length of 372 miles of metre and narrow gauge lines under State management.

The approval of the Government of India has been received to the following projects and arrangements are being made to start construction :—

- (a) Shimoga-Arasalu section of the Shimoga-Bhatkal Railway ;
- (b) Kemmangundi-Benkipur Tramway ;
- (c) Agasanahadlu-Benkipur Tramway.

The Government of India have also intimated that they have no objection to the construction of a railway from Nanjangud southwards within our own territory. The District Board of Mysore has offered to raise a loan to finance the scheme and the question of starting construction is under consideration. Arrangements are in progress for transferring the Railway head-quarter offices from Bangalore to Mysore City.

GEOLOGY AND MINING.

Owing to the uncertainties of transport and the need for strict economy in the use of explosives, the mining companies on the Kolar Gold Field have found it necessary to slightly reduce the production of gold until the restoration of normal conditions. The output of bar gold during 1917-18 was 524,264 ounces, of an approximate value of Rs. 3,01,45,365, which shows a decrease of 25,552 ounces in output, and Rs. 14,76,270, in value, as compared with the figures of the previous year. The total royalty payable is approximately Rs. 17,24,000 against Rs. 18,10,913 in 1916-17.

PROGRESS, MORAL AND MATERIAL.

A College of Engineering has been established in Bangalore and the first-year B. A. Class has been opened in the Maharani's College for women. Proposals for starting an Agricultural Faculty are under consideration. The Degree examinations were held for the first time during this year and forty candidates have graduated. The first Convocation for the conferring of degrees will be held on the 19th instant. Arrangements are being made to develop the extension and publication departments. The Oriental Manuscripts Library has been reorganised and improved. Five endowments of the value of Rs. 25,000 were received during the year and two endowments of Rs. 25,500 have since been secured. The endowments to the University, so far obtained or promised, aggregate Rs. 1,30,000, which, having regard to the short time the institution has been in existence, is a gratifying evidence of public appreciation.

EDUCATION.

The progress of education during the year 1917-18 was marked by an increase of 2,094 institutions and 41,138 scholars. On 30th June 1918, there were

11,294 public and private institutions in the State with 366,856 pupils. A new English High School has been opened at Davangere and the District Normal Schools at Bangalore, Tumkur and Shimoga have been raised to the status of Kannada High Schools. The scheme of compulsory primary education is in active operation in 68 centres and preliminaries have been completed in the 170 centres to which the extension of the scheme was sanctioned during 1917-18.

The education of the depressed classes continues to receive attention, an allotment of Rs. 50,000 having been specially earmarked for this purpose. A Panchama Boarding School for Tumkur and a smaller one for Chikmagalur have been sanctioned and measures are being taken to develop the Panchama Boarding School at Mysore into a Central-Educational and Technological Institute for Panchamas and other depressed classes.

The statistics of female education show a small increase of 76 schools and 2,305 pupils during the year. Attempts are being made, as far as possible, to staff girls' schools with women teachers and an attractive scale of pay has been fixed in order to induce lady graduates to enter the teaching profession.

The number of practical instruction centres rose from 170 to 290. Commercial classes have been opened in the High Schools at Chikmagalur, Hassan and Channapatna. A Director of Boy Scouts has been appointed and Scout troops have been organised in Bangalore, Mysore, Shimoga and other centres.

AGRICULTURE.

There was fair progress in the operations of the Agricultural Department during the year. The provisions of the Pest Act were for the first time applied in a few areas, generally with satisfactory results. Practical courses of instruction continued to be held at the Agricultural School, Hebbal, for the benefit of rural school masters and agriculturists.

INDUSTRIES AND COMMERCE.

The department is actively engaged in developing the weaving industry and a beginning has been made with metal works and soap manufacture. The Central Industrial Workshop has been developed. The starting of District Workshops at Shimoga and Chitaldrug has been sanctioned and the Chitaldrug District Board has offered to meet half the cost of the latter institution. Forty-six loan applications, involving a sum of Rs. 2,75,578, were sanctioned during the year and 40 installations of machinery and plant were undertaken, out of which 24 have been completed. The department was reorganised

during the year and a separate commercial section constituted.

CO-OPERATIVE SOCIETIES.

The Bill for the amendment of the Mysore Co-operative Societies Regulation has been passed into law. In order to ensure more efficient supervision over the work of the societies, the superior staff of the department has been strengthened. One thousand and ninety-seven societies were working at the end of the year with 82,000 members and a working capital of Rs. 66,00,000. There was increased co-operative activity in the *malnad*, where the number of societies has reached 173.

ECONOMIC CONFERENCE.

Nine meetings of the Standing and Central Committees of the Economic Conference were held during the year. The outstanding feature of the work of the Education Committee during the year was the development of popular libraries. Seventy-seven travelling libraries, 22 taluk libraries and 89 rural libraries have been organised. Improvement of live-stock and organization of co-operative societies for agricultural purposes were among the principal subjects which received the attention of the Agricultural Committee. The Industries and Commerce Committee has several useful and constructive schemes on its programme, but the difficulty of procuring the requisite machinery made it necessary to restrict immediate attention to minor industries which require no elaborate equipment.

SPECIAL SCHEMES.

The progress under the Village Improvement Scheme was fairly satisfactory. The number of committees rose from 8,661 to 8,820 which served a population of 47½ lakhs. Five thousand two hundred and thirty-nine committees attended to works of communal benefit and 4,958 subscribed for one or more newspapers. There was a slight decrease in the cost of works carried out with the aid of Government grants, the aggregate cost being Rs. 1,10,760. Two thousand three hundred and sixty-four miles of cart track were improved by the committees and a sum of Rs. 67,156 was collected for the village common fund against Rs. 31,923 in the previous year. Including the twelve courts newly established, 172 villages courts were working at the end of the year. The total number of tank panchayets sanctioned up to the end of 1916-17 was 82 and the constitution of fifteen more was sanctioned during 1917-18. Forty-five blocks measuring 17,830 acres were notified as village forests. Seven new blocks were granted during the year under the Large Landed Estates Scheme. Out of 706 minor tanks that were under restoration during the year, 106 were completed. A sum of Rs. 1,35,722 was spent out of the sanctioned allotment of Rs. 2,44,000.

Progress in the construction of drinking water wells is still unsatisfactory. Only 239 works were completed and a sum of Rs. 69,217 spent during the year. Hand pumps are being installed, as far as possible, to protect wells from contamination.

MALNAD IMPROVEMENT.

The continuance of the Malnad Improvement Scheme for a further period of five years has been sanctioned and the annual grant raised from Rs. 1½ to 2 lakhs. Attention continued to be paid to the clearance of rank vegetation, provision of drinking water wells, construction of drains, shifting of insanitary village sites, provision of medical relief and distribution of quinine. Vaccination has been declared compulsory in the rural areas of the *malnad*. Arrangements are in progress to convert the female dispensaries at Shimoga and Chikmagalur into small maternities and to train local women in midwifery. The proposal to establish a land bank in the *malnad* and the question of labour supply are receiving attention.

Future Lines of Work.

THE NEW OUTLOOK.

The present war has altered the general outlook of progressive people all over the world. It has brought to light the value of unity, the beneficial effects of co-operation and combination, on a scale never witnessed before. It has revealed new unsuspected values in organization, collective enterprise and Government control of concerns of national importance. It has led to the discovery of new powers and fresh methods of work which, if used for the arts of peace, are of rich promise for the welfare of mankind.

The years which follow the war will be a period of strenuous reconstruction. The aim of every after-war reform is the same, namely, to add to the comforts of the people by increasing production and wealth. England is preparing in every way to meet the new situation. A Ministry of Reconstruction has been created which is working hand in hand with other related Ministries. Notwithstanding the war's pre-occupations, the belligerent nations have been promoting education more diligently during the war than ever before. Every progressive nation, whether belligerent or neutral, is aiming to secure for itself better organization, greater co-operation from its people, improved methods of manufacture, cheap supply of raw materials and increased enterprise in trade.

The developments we have undertaken in Mysore are in consonance with the trend of this new thought. We have begun late and our efforts are yet feeble. But we have in a small way educated the people to the importance of economic development. Our duty

now is to improve our organization and methods of work and to keep touch with reconstruction problems in advanced countries. We have to go along the same road with them, though following at a great distance behind.

ADMINISTRATION.

Next to the ordinary work of administration and the efficient performance of routine duties, development work occupies an important share of our attention at the present time. We have to develop both the material resources of the country and the energy and capacity of the people. Of the two, the latter, is the more important.

DEVELOPMENT OF MATERIAL RESOURCES.

The work of developing the material resources is making good progress. We have, in a small way, been building new railways, extending hydro-electric works, constructing irrigation works and restoring and repairing minor tanks. The forest and mineral wealth of the country is also being utilized. Various other schemes which can be undertaken by Government are under investigation. But the resources of the country can not be effectively developed unless private enterprise steps in and the people themselves attempt large scale production and start industries and manufactures on a co-operative or joint-stock basis.

TRAINING THE PEOPLE.

Opportunities of political and civic training have been afforded by His Highness the Maharaja, by the privileges conferred on the people in recent years in connection with the constitution and functions of the Representative Assembly, the Legislative Council and the Economic Conference. The District and Taluk Conferences are also materially helping in the education of the people in the duties of citizenship. The new Local Self-Government Scheme offers special opportunities of service to large classes of population. If the scheme is to realise its promise, however, our people should see to it that, as far as possible, only men of constructive ability and executive capacity are singled out and returned as their representatives on the public bodies.

The amount now being spent on training the people and equipping them for the work of the country is very inadequate. The actual expenditure incurred at present for training people for economic work is perhaps a little less than Rs. 2 lakhs. This outlay might with great advantage be doubled and the money will come back to the country a hundred-fold in due course. In this connection, perhaps, it may interest you to know that, in some of the more progressive countries, very large sums of money are spent both from State and Municipal funds on measures connected with civic and educational publicity.

FINANCE.

Coming to finance, it is clear that no large increase of revenue can be expected from land tax and we have to look to other sources to meet the growing expenditure of the country. A beginning will be made with income tax which will be levied at the rate of 3 to 6 pies in the rupee on non-agricultural incomes exceeding Rs. 1,200 per annum. One merit of this tax, if a tax can be said to have any merit, is that the poorer and the lower middle classes and the vast masses of the agricultural population will be excluded from its operation. The tax will bring to Government a progressive revenue with the development of industries and trade in the country.

We have constructed productive public works within the past few years at an outlay of about Rs. 3 crores and we propose to continue the policy in future by raising loans, if necessary. It is estimated that in the next few years, the normal programme of public works for the State, including railways, irrigation works, electrical works and industrial undertakings, will require a provision of about Rs. 75 lakhs annually. The credit of Government may be utilized more largely than is being done at present for borrowing for its own purposes and also for enabling local bodies, private syndicates and corporations to obtain loans.

PUBLIC SERVICE.

A continuous improvement in the character of the public service is being attempted. Picked young men are appointed as recruits for all the important departments, by means of examinations and by selection. Provision is made for training officers abroad and for the higher appointments, and special steps are taken to increase the representation of backward communities in the public service. The efficiency of officers and offices is receiving increasing attention. All the important departments of Government have been reorganised in recent years. Endeavours are being made, by closer scrutiny, to ensure that every department and office acts up, as far as possible, to the rules and standards laid down for its guidance.

GROWTH OF WORK IN THE ADMINISTRATION.

Among the many traditional beliefs of the people is the idea that we can avoid growth of work, and growth of activities; that, at best, such growth may be tolerated but is not a thing desirable in itself. With the growing economic and social awakening of the people, it is inevitable that the work of administration should grow and that the establishment should be increased to cope with it. If it is of the proper kind, growth of work means

activity, means progress; and progress, if it is in the right direction, will bring increased wealth to the people and additional revenue to Government. This is the experience all over the world and it is on these ideals that our administration is also being built up.

ECONOMIC PROGRESS.

The main objects of economic policy in every country are :—

- Augmenting agricultural produce ;
- Increase of production in industries and manufactures ;
- Promotion of trade ;
- Extension of education and vocational training.

RECENT MEASURES.

We have made a substantial beginning to promote all these objects. Under education, the University is being developed and strengthened, and the total school-going population has increased from 1,38,153 in 1910-11 to 3,66,856 in 1917-18, showing an increase of 166 per cent. In respect of compulsory education, good progress is reported in the case of boys and a beginning has been made in the case of girls. The operations of the Agricultural Department have undergone considerable expansion. Sericulture is receiving marked attention and a commencement has been made to encourage horticulture. The new Industries and Commerce Department is playing an important part in the development activities of the country. The Sandal Oil Factories have been working satisfactorily and work on the Iron Scheme has been put in hand. During the last five years, there has been a notable expansion of the co-operative movement, the number of societies and their membership having increased three-fold and their working capital more than five times.

STANDARDS.

A great deal more yet remains to be done. But no large or rapid progress is possible without definite objectives, well-defined methods of work and an adequate and efficient organization. It is necessary to place some definite standards before the public, some clearly defined aims for their guidance. As instances of what is meant by standards, I may mention three or four we have had in view, selected at random. One of them is to double the agricultural produce of the country in ten years. Another is to induce every family in the village to lay by enough food grains or money for maintaining the family for a couple of years so that, in times of short rainfall, it may not run the risks of starvation. A third standard aims at doubling the present school-going population in five years. A fourth contemplates increasing the number of persons

engaged in industries and trade eventually to 25 per cent of the total population.

ESSENTIAL IDEAS.

We must shape our habits and methods according to the latest experiences of progressive countries, particularly in respect of corporate discipline and collective morality which are new to our people. The importance of working together in large numbers and pooling resources and capital should be brought home to all. Education should come to be regarded as an investment and accepted as a birthright of the meanest citizen in the land. Science and the use of machinery should be made subjects of popular knowledge. A persistent effort should be made for adequately training adult workers in their respective trades and callings. Standard business ideas and practices should be spread by lectures and leaflets among the entire population.

ORGANIZATION.

Our central organization for economic work is fairly complete. The arrangements for associating the mofussil population with the central organization are being perfected. A scheme to enlist the services of a large number of workers in the activities connected with education, agriculture, industries and commerce, has been sanctioned and is making fair progress. Helpers and associates are classed into three grades according to the standard of work expected of them. It is hoped that the leading representatives present here will help to make further additions to our working force.

The organization for local work requires further development. The Progress Committees of the unit areas have now no specific executive agency to reach the cultivators. It is suggested that we must have one official in each *hobli*, or section of a taluk, for propaganda work, to ascertain the wants of the rural population and furnish statistical and other information to the central agencies. If the official is chosen from within the *hobli* itself, we shall be creating an active agency for self-improvement in each local area.

CIVIC AND SOCIAL PROGRESS.

All the activities not deliberately classed as administrative or economic may be said to fall under "civic and social." Their object is, as the name implies, to train the people to become good citizens and good members of society. It is proposed, by means of a special organization, to spread among the people of the country a knowledge of literature, art, culture, manners and morals; to inculcate habits of discipline, orderliness, loyalty to the Sovereign, love of country and spirit of service; to reform social customs and practices by raising the

status of women, improving marriage customs and elevating the backward and the depressed classes; to create opportunities to every one according to his station in life to bring up healthy families, to live in clean and sanitary dwellings and to help in building up well-planned and beautiful villages and towns; and generally to enable the non-official public to co-operate with Government and with one another in the general uplift of the masses of the population in all parts of the State. To this end, the public of Mysore have recently started an organization known as the Civic and Social Progress Association which has the support of the leading public men of the country.

The object of Government in intruding into this sphere of work is to stimulate effort, to induce the people to think out problems for themselves, initiate improvements and build up sound habits and practices and appropriate standards of conduct suited to the times. Government do not desire to lay down any fixed rules or standards. The responsible public leaders will do this. They will study the wants and defects of each community and each grade of the population and suggest the needed reforms. If the representative leaders investigate the weak points in the political and social life of the country in this way, the means of improvement will suggest themselves in the natural course; and by further discussion and familiarity, the investigators will become enthusiastic supporters and advocates of their own remedies. By constant preaching through the press, by book and platform, we may confidently hope that the average citizen will begin to imbibe the spirit of reform and attain to higher standards of industry, capacity and refinement.

RECONSTRUCTION.

The idea of reconstruction has a special meaning for us in Mysore. Some three years before the war, we began to take stock of our economic position. We found, by comparison with advanced countries, that the extent of education in Mysore was roughly about one-sixteenth of what it should be and, in regard to earning power, we stood in the same or worse relation. We now know that economic efficiency and education go hand in hand, and that, by neglecting education in the past, we have stood low in the scale of productivity and earning power. In economic matters, therefore, it is a case of construction for us, and not "reconstruction." It is a case of beginning at the very beginning, to build up a new structure altogether, on modern lines.

We have made a beginning in organization and in inducing the people to work together. We have catalogued and placed before them problems of immediate future interest. We have got together

conferences, associations, committees and honorary workers in various parts of the country. We are taking steps to make all grades of the population, particularly the vast masses of agriculturists, to participate in the new activities and work to a common end. If the inhabitants all over the country consent to put their backs into the task and make a united effort, it will not be difficult to double or even treble production within a decade and create the additional wealth which the country so sorely needs. From the many warning voices we have had in the course of this year, few will deny that the creation of a margin of safety in this way is essential for the very existence of our people.

Place of Indian States in the Reforms Scheme.

In last year's address I indicated what, in our view, was the proper place of Indian States in any scheme of Constitutional Reforms and the present address would be incomplete if I omitted reference to that momentous question.

In the historic report issued as a result of their enquiry by the Right Hon'ble the Secretary of State and His Excellency the Viceroy, the claim of Indian States for a share in the deliberations of the Government of India is definitely conceded. The Report contains specific recommendations designed firstly, to improve the relations of Indian States with the Government of India and secondly, to give the States a voice in the central government in regard to the administration of affairs of common interest to both British Provinces and Indian States.

I need make no reference to the proposals which come under the first head because, although valuable, they have no particular bearing on constitutional reforms which affect India as a whole. The recommendations under the second head comprise:—

- (1) The creation of a Council of Princes as a permanent consultative body; and
- (2) Provision for joint deliberation in matters of common interest between the Council of Princes and the Council of State.

Some of the Rulers of the States may not be prepared to join a Council of Princes. Some may be disinclined to take part in acute political controversies; and, in any case, there is no guarantee that every State will receive adequate representation in proportion to its size and importance. The Council of Princes will be merely "a machinery for collective consultation" and according to the proposals put forward, joint consultation with the Council of State will be only permissive. The Council will have no constitutional position, its functions will be purely advisory and its views

are liable to be overshadowed by those of the Imperial Legislature.

When the Rulers of Indian States were consulted, one view urged was that the Indian States should have the privilege of sending representatives (not necessarily Princes) to a second chamber, where the representatives from British India as well as from the States might sit face to face and deliberate on matters of common interest. This view seems to be favoured also, in essential particulars, by the distinguished authors of the Report, although, on account of the unpreparedness of the States themselves, they express their inability to recommend its immediate adoption. The Right Hon'ble the Secretary of State observed more explicitly in the House of Commons on 6th August 1918, that "the proposed germ of a second chamber also indicated a way by which, in due course, the Princes, now rather isolated in constitution, might join for joint deliberation for common affairs, and only for common affairs, with the Upper House."

The future prosperity of the States is closely bound up with the manner in which the common interests of the Empire are administered and it is of the highest importance to them to secure an adequate voice to safeguard their interests in the new constitution.

A solution on the following lines will perhaps meet the case as it fits in with the ideal of the progressive realization of responsible government in India:—

- (1) The Indian States may, to begin with, be permitted to send their representatives to the proposed Council of State, the number of representatives being in proportion to their relative population, which is roughly 23 per cent of the whole.
- (2) Eventually, when responsible government is fully established and both the assemblies of the Government of India come to be concerned principally with questions relating to the Indian Empire as a whole, the States may be allowed to send representatives to both the assemblies.
- (3) As regards the subjects which come up before these assemblies, two separate schedules may be maintained according as they pertain to matters—
 - (i) of common interest, or
 - (ii) of interest to the British Provinces exclusively;

and the representatives of Indian States permitted to participate in the discussion of subjects of the former class only.

The difficulty in the way of giving practical effect to these proposals seems to be the fear, widely entertained, that participation in the manner stated would give the parties concerned, *i.e.*, the Indian States and the British Indian Provinces, the power of interfering in each other's affairs. There is no warrant for such an assumption because, in any common meeting of the two classes of representatives, questions of sectional interest will be excluded as a matter of course and, as stated in the Report, when the Provinces ultimately become self-governing units, the central government will come to deal almost entirely with matters of common concern.

If the experience of the other parts of the British Empire, *i.e.*, Canada, Australia and South Africa, is to be any guide, there can be no doubt that the representatives of the Indian States will also ultimately find a place in both the senatorial assemblies of the Government of India.

As I stated before, the central idea of after-war reforms in every country is economic and the most pressing need of this country also is economic development. If there is to be any reconstruction in India after the war, if we are to have opportunities of participating in the world's progress, we require all the help and encouragement which the resources of a united India can give to its constituent parts. It is for this purpose that we ask for direct representation in the Councils of the Indian Government. The reformed Government of the future should be the prop and pillar of the individual States in this respect. Without the countenance and support which a powerful central government can give, the Indian States will find themselves helpless in the severe world competition which will confront them after the war.

TOPICS FROM ECONOMIC PERIODICALS.

The Thrift Habit.

We take the following from the *American City* for July, 1918:—

The Winston-Salem Squirrel Club is planning campaign in which it is hoped to make *every home* in this city a member by virtue of its *having adopted the thrift habits of the squirrel in laying in supplies for the winter* during the summer and fall months. This characteristic is already manifesting itself in many of the homes, and the indications are that when a mass meeting of the citizens is called in December, not only will the community have arranged to feed itself during the winter, but a surplus will be available for contribution to the resources of the Government to care for its army and navy at home and abroad.

The launching of the conservation movement in Winston-Salem through the organization of a Squirrel Club was suggested by the secretary of the Board of Trade. The Squirrel Club has adopted for its motto, "Be a squirrel this year." The Mayor is the president of the Club, and the Secretary of the Board of Trade is its secretary. The executive committee is composed of the members of the city administration and the county commissioners. Every man, woman and child in the city and county is eligible to membership.

The Club intends to make use of every organization in the city, such as the Board of Agriculture, the civic and women's organizations, the Boy Scouts, the Council of Defense, the schools, the farm demonstrator, the city and county food administrators, etc. Through the spring and summer months, the Club will impress upon every one the necessity of pledging himself to plant a garden, raise food and produce, can more jelly and preserves, etc., and to lay in a supply of all kinds of foodstuffs, coal, wood, etc., so that on December 1, 1918, at the mass meeting which is to be called by the Mayor and his executive committee, it can be stated with certainty that the city is ready, the county commissioners can report that the county is ready, and the heads of the households in both city and county can report that they are ready, to face the winter of 1918-19.

Reports will be called for from coal dealers, wood yards, the Salvation Army, the Associated Charities, and all the other interested organizations, to ascertain if they are ready and independent of any

transportation difficulties. If it is found on that date that not every one is ready, steps will be taken immediately to overcome any oversight in the preparations, so that every one can look Old Winter in the face and say that the city is not only prepared to take care of itself, but that Winston-Salem has done its duty by piling up a surplus for humanity.

There are no dues or other obligations connected with membership in the Squirrel Club; it is simply a plan originated for the purpose of making sure that Forsyth County and Winston-Salem are prepared for any emergency and will not be caught napping.

It is planned to issue a transparency of a squirrel, to be placed in the windows of all the homes that have followed the squirrel's example and are prepared for the winter months.

The Chamber of Commerce of the United States, in a recent bulletin sent out to commercial organizations all over the country, highly commended the plan and urged the formation of Squirrel Clubs in every city, town, hamlet and county in the United States. The editors of the food conservation departments of several magazines and papers, including the *Ladies' Home Journal*, *McCall's Magazine* and the *New York Tribune*, have requested details of the organization and plan of activities.

The idea promises to have a wider field of activity than was ever hoped for. Not only the city and community are to be benefited by the organization, but scores of communities scattered throughout the nation are planning to profit by the suggestion.

THE IDEAL FARM TRACTOR: A PERSONAL VIEW.

A note in "The Agricultural Gazette" says:—

I am a farmer, and not an engineer. I have owned, driven, hired and superintended tractors. I have 700 good acres to plough yearly, and I write this from that point of view. Mr. Prothero has stated that tractors are in their infancy. This is undoubtedly true.

Engineers seem to think that all farm land consists of large, flat fields, easy of working. As a matter of fact, I believe only 15 per cent of arable in Great Britain may be fairly described as easy; while over 80 per cent is more or less on a hill, and one must, in the very nature of things, nearly always plough up and down hill.

The ideal tractor is one that will plough heavy clay efficiently, and will work up hill without

overloading. No tractor will do this yet. A tractor that will, can plough anywhere, and on any other soil, and would be a real "seller." It is the heavier type of soil that grows the heavy crops; and the occupiers of this type of land want tractors far more urgently than the light land man.

WEIGHT.—25 cwt. is the outside limit; 15 cwt. would be better. Weight and power more or less go together; but I would sacrifice the former rather than add weight.

DRIVE.—I think we must get right away from the four-wheel traction engine type. A traction engine, with its uneven pressure, is the last thing a farmer wants on his plough land. Besides, this type can never "finish," and the ideal tractor must finish (see later). The caterpillar chain track would undoubtedly be the thing. We know its drawback; and the cost of renewals makes it an impossibility now. May be there is scope for invention here. The best idea I know is that adopted by Mann's steam tractor, a one piece roller wheel. 3 ft. wide, 2 ft. 6 in. diameter, should be the limit; better 2 ft. 6 in. wide. (See "Finishing" later.)

ENGINE-POWER.—20 h. p. seems about the thing; but, most important of all, we must have a simple engine and transmission.

The ideal tractor will only be wanted for something less than 100 days in the year; and the go-ahead farmer who has more work than this will get two, three or four tractors. The engine must be the very simplest and plainest. Farmers and their men manage stationary oil engines up to 50 h. p. quite easily. I would go right back to the old oil engine. Complicated carburettors, magnetos, oil and fuel pumps should be absolutely dispensed with—they spell breakdowns. Let the oil splash and the fuel drip. I would even try to do without a fan; a big but ugly radiator can do it; I have seen one.

Also, it *must* be an easy starter. Most present day tractors are tough dogs to start, and to spend an hour in the early morning winding up a heavy tractor reduces a man's efficiency for the whole day.

SPEEDS.—One really wants a hundred speeds. My idea is at least five. Present day tractors are speeded too high. Engineers must always remember that fast ploughing is bad ploughing, which means bad crops. A team of steady Shire horses in clay never exceed $1\frac{1}{2}$ miles per hour, and are, very often under the mile. A choice of two very slow speeds also would solve the hill-climbing problem. I would have my speeds $\frac{3}{4}$, $1\frac{1}{4}$, $1\frac{3}{4}$, $2\frac{1}{4}$, and 3 miles per hour.

The change gear arrangement can be as primitive as one likes. A lever and a safety catch for each

gear would be quite permissible, Let us get away from the quick change used in cars; it is unnecessary. A cham drive is quite allowable, but it must be a good chain.

STEERING.—This is very important. One *must* have a oneman outfit. No tractor that is not will sell to a profit. Reasons would fill a book. The plough and motor in one obviously will not do. Do not count on the self-lift plough. We must have a plough we can see and regulate as we go along. The Moline tractor and the Bates' Steel Mule have got the idea—the steering wheel and controls right back behind, and the plough just in front and under the driver.

The only idea worth borrowing from a motor-car is the actual method of steering the front wheels. Coyp this. Do not make it hard; one doesn't want to wind a windlass all day. The front wheels must be adjustable up and down and sideways.

FINISHING.—No tractor yet can finish properly; it leaves irregular streaks well compressed, and the wretched horses have to finish. The carter hates the job, and no amount of supervision, encouragement or extra money will make a good job of it. It means shillings an acre lost on the crop, and all this is put against the tractor. My ideal tractor will have its 2 ft. 6 in. single roller wheel behind, the plough adjustable anywhere behind this, the off front wheel in the furrow and the near front wheel adjustable to the other furrow when one gets one small enough. With a little skill one can then finish, always remembering that the last furrow should be a trifle deeper than all the others.

WHEEL BASE.—As short as possible; the shorter the handier.

CLEARANCE.—We do not want much; 10' in. the minimum, perhaps. Keep the centre of gravity as low as possible.

WHEEL GRIP.—Spuds are good on some land, but, in spite of the Edinburgh trials, I prefer strakes set slanting and close: 5 in. apart is quite enough. These can be fixtures, for to have to remove strakes or spuds every time we go on a road is worthy of Bedlam. It means half a day lost at least for two men and a tractor.

The obvious means of road transport is rubber-shod wheels on extended axles fore and aft. An ordinary carriage jack and five minutes should do it. There is no difficulty about it on a light tractor. Besides, it naturally gives an increased speed on the road.

Ploughs should be left to the farmer. He must have a plough to suit his individual land.

MATERIAL.—The very best. Something that will bend, not break, and then go back into place again. Have all nuts the same size, and all locked.

Do not worry about anything except ploughing, and only breaking ploughing at that. It is the heavy pulling we want done. At all the other operations horses will be top dogs for many years to come. Possible exceptions are rolling on certain land in certain conditions, and drawing mowers and hinders. Horses will do these cheaper, but not so expeditiously as tractors; but do not think about these when designing.

Do not worry about road hauling. Very few farmers have anything except short-distance hauling. Any contractor will tell us that for this horses are more economical than tractors or lorries. Add to this the fact that a farmer keeps his horses at half the cost the contractor does.

Do not worry about barn machinery. All likely tractor buyers have very efficient oil engines doing this job better than a tractor will; and even for threshing the steamer is at present the more efficient. Stick a 4 in. face belt pulley on a shaft giving a suitable speed; it might be useful.

"It is not a hard thing to ask of you, ye sons of Vulcan." Why, at the present moment, a simple, light tractor which would run along ploughing the furrow at 1½ miles per hour with a consumption of something under 6 gallons per acre, would sell like hot cakes, provided it was guaranteed *to keep on doing it* with not more than one breakdown a month. I speak as one who knows, because I have working at this moment a few hundred yards away a weird contraption, faked up and adapted by myself, which fulfils these conditions, except that we omit the monthly breakdown so far, and we sometimes draw two furrows.

PRICE.—Well, anything up to £1,000. There are not a few big farmers who would give the latter for Absolutely It; but I fancy an outfit selling round about £250 would pay the biggest dividends. Anyway, the money is waiting; and the go-ahead farmer nowadays will not worry about the price if he sees it worth while.

To sum up, we want—and want very badly—a light, simple one-man outfit, even pressing, many speeded, and practically unbreakdownable, or, if you like it better, fool-proof. Well, this ought to help some one. If I have put any keen men on the track and he wants any further help from a farmer, I shall be delighted.

ECONOMIC NOTES. INDUSTRIES.

Control of Cotton Cloth.

CONFERENCE PROCEEDINGS.

The following is a summary of the proceedings of the Conference regarding the control of cotton cloth recently held at Bombay. The following gentlemen were present at the Conference:—

Mr. F. Noyce, I.C.S., President.	
Mr. G. Wiles, I.C.S., Chairman, Cotton Contracts Committee.	
Sir Vithaldas Thackersey	} Bombay Millowners Association.
Mr. W. H. Brady	
Mr. R. H. Brooke, Bombay Chamber of Commerce.	} Bombay.
Mr. Ambalal Sarabhai, President, Ahmedabad Millowners Association.	
Mr. J. F. D. Engel, Chief Inspector of Factories.	
Mr. Pramji Virji, Bombay Native Piece Goods Merchants' Association,	
Mr. F. Stones.	
Mr. J. Gray, I.C.S.	Madras.
The Hon'ble Mr. C. A. H. Townsend, I.C.S., Director of Civil Supplies.	Punjab.
Mr. J. T. Donovan, I.C.S., Registrar of Co-operative Societies.	} Bengal.
Mr. C. W. Rhodes of Messrs. Hoare Miller and Company.	
Mr. P. W. Murphy, I.C.S., Director of Land Records.	} Bihar and Orissa.
Mr. A. K. Bose, Assistant Controller of Munitions.	
Rai Bahadur Radha Kishan Jalan.	Assam.
Rai Bahadur Kanak Lal.	} United Provinces.
Mr. C. O'Malley, Director of Industries.	
The Hon'ble Mr. T. Smith.	Central Provinces.
Mr. C. Leftwich, I.C.S., Director of Civil Supplies.	Baluchistan.
Mr. F. W. Johnston, C.S.I., C.I.E., I.C.S.	Central India.
Mr. J. H. Cox, C.I.E., I.C.S., Director of Civil Supplies.	} Baroda.
Mr. G. C. Desai, Director of Agriculture.	
Mr. R. R. Pawar.	} Indore.
Rai Bahadur Sardar M. V. Kibe, Minister of Commerce.	
Mr. Puranik.	
Mr. Peroshaw.	

The opinions expressed at the Conference will in due course have the careful consideration of the Government of India.

(1) *Definition of the term "poorer classes."*—It was considered that no definition of the term "poorer classes" should be laid down as the cloth standardized should be such that it would only be purchased by the poorer classes. Steps should, however, be taken to ensure that no person should buy more than a certain quantity of standard cloth at a time, the amount to be fixed by Local Governments.

(2) *Distribution of standard cloth.*—In regard to the distribution of standard cloth, the view taken by the majority of the Conference was that, in addition to the distribution of the cloth by means of government, municipal or local board shops, the agency of licensed dealers should be utilized, if Local Governments considered it suitable. The representatives of the mill industry were, however, of opinion that licensed dealers should not form part of the scheme for the distribution of standard cloth.

(3) *Indents for standard cloth.*—It was considered that there should be a controlling authority for each Province requiring standard cloth, who would consolidate the provincial indents and forward a consolidate indent to the Controller of Cotton Cloth. The Provincial controlling authority should send the Controller a monthly indent of his requirements, but, in order to ensure as little dislocation of

mill organization as possible, the output required from the mills should be fixed for three months.

(4) *Priority certificates for standard cloth.*—It was held that all standard cloth should be given priority certificates for transport by railway and that it would relieve the position in regard to the shortage of cloth if all cloth were given such certificates.

(5) *Financial arrangements in regard to standard cloth.*—It was considered a matter of great importance that Local Governments should keep the Controller of Cotton Cloth in funds in order to enable him to pay for the standard cloth required by them on receipt of the signed railway receipt from the Station Master of the despatching station. It was held that the railway freight on standard cloth should be paid at destination.

(6) *Stamping of standard cloth.*—The proposal that standard cloth should have a registered mark which might take the form of a coloured thread running from end to end was accepted. It was considered that there was no objection to mill-owners using their own mill marks and tickets for standard cloth, and that, if different qualities of cloth were standardized, the standard, e.g., standard A, B or C, should be clearly stamped on the cloth.

(7) *Control of the price of yarn.*—It was considered that this question might be reserved for further consideration after some experience had been gained of the effect of the manufacture of standard cloth. The representatives of Bengal, Bihar and Orissa,

Assam and the Punjab were, however, in favour of control of the price of yarn, in the case of Bengal for general reasons and in that of the other provinces in the interests of the hand-loom weaving industry. The case of mills which did not spin their own yarn was raised. In view of the fact that such mills were exceptional, it was held that it might be left to the Controller to deal with them as a special case if necessary.

(8) *Control of the raw or manufactured cotton.*

(a) The following resolution was passed by the Conference in regard to the control of raw cotton :—

"This Conference recommends that the Government of India should take power at once to restrict exports of raw cotton by the introduction of a system of licensing, the degree of stringency with which such powers would be exercised to be decided as circumstances subsequently dictate. Orders should be passed on this recommendation at a very early date so that exporters should know where they stand."

(b) It was held that the necessity for controlling the export of yarn had not been established and that there was no necessity to control the export of piece-goods.

(9) *Interference with existing stocks.*—The following resolution was passed by the Conference :—

"This Conference considers that stocks are being unreasonably withheld from the market, in many cases by those not accustomed to deal in cotton goods. The Conference therefore recommends that the Government of India should request Provincial Governments to take such steps, in consultation with the trade, as may be necessary to remedy this state of affairs."

Mr. Pramji Virji, representative of the Bombay Native Piecegoods Association, and Mr. P. W. Murphy, I.C.S., representative of Bihar and Orissa, dissented from the resolution.

(10) *Price of cotton to be adopted as the basis for standard cloth.*—It was decided that this question should be left to the Controller and the Advisory Committee who should fix a fair and reasonable price for cotton having regard to all the circumstances and that the price of cloth should be fixed for three months at a time.

(11) *Excise duty.*—The Conference recommended that, with a view to cheapen the price of standard cloth to the consumer, the excise duty on standard cloth should be deducted or refunded in the same way as the duty on exported cloth is at present deducted or refunded.

(12) *Mills engaged on army work.*—It was held that if mills engaged on Government contracts were working on ordinary terms, there was no justification for special treatment but that if Government were receiving special terms, the mills should receive special treatment to an extent to be decided by the Controller and the Advisory Committee in each case. The only mills which appeared to require special treatment were those in Madras and Cawnpore.

(13) *Importation of looms from Lancashire.*—The following resolution was passed on this subject :—

"This Conference recommends that greater liberality be shown by the Munitions Board in sending applications for renewal of machinery and spares home to England so that greater efficiency and better running of the existing machinery should be secured in view of the special circumstances arising from the fact that the greatest output is required from every mill owing to the necessity for the production of more cotton cloth. Pressure should also be brought to bear on the Home authorities in this matter."

It was further held that priority should be granted for new looms to replace existing ones as this would considerably increase the output of cloth.

(14) *Forward contracts.*—The view held by the Conference was that if the output of only ten per cent of the looms was required, there would be no serious interference with forward contracts: beyond that proportion, serious interference would be involved. It was held that if the effect of the law was that merchants could not cancel their contracts but that mills could fulfil them in order of priority, after providing for the manufacture of standard cloth, then no further protection to the mills was required. If, on the other hand, the purchaser could cancel his contract owing to late delivery resulting from the manufacture of standard cloth by the mills, the situation would be serious and provision should be made to meet it. Protection for the manufacturer would, however, be required only in the case of the balance undelivered. The proposal made by Sir Vithaldas Thackersey that Government should give a definite ruling in regard to the protection of both manufacturers and dealers in the matter of forward contracts either in the Act itself or in some other way was accepted but it was considered that it would be better if the protection were definitely stated in the Act itself. Mr. Pramji Virji dissented, holding that all contracts for forward delivery should be *ipso facto* cancelled by the passing of the Act. The suggestion was put forward that, in order to reduce interference with forward contracts as far as possible, shirtings and goods which were not of necessity made to definite widths, as in the case of *dhoties* and *sarees*, should be made as far as possible on looms under 36 inches or over 50 inches reed space, the looms of intermediate width being reserved for *dhoties* and *sarees*.

(15) *Relaxation of the Factory Act.*—It was considered that the differences of opinion amongst the mill owners in regard to the desirability of relaxing the Factory Act were so great that the question could not be profitably discussed by the Conference.

(16) *Allocation of orders.*—The question whether the output of standard cloth required from the mills should be based on the number of looms actually in existence in the mills or actually running was discussed and it was decided that this should be left to the Controller and the Advisory Committee.

(17) *The requirements of standard cloth for the different Provinces were examined.* The only Provinces which were in a position to give a definite statement in regard to their requirements were Bengal, Bihar and Orissa, and Assam. The Bengal representatives estimated their demand for standard cloth at 1,000 packages per month consisting of 200 packages of shirtings averaging 3,600 yards each, 500 packages of *dhoties* averaging 4,000 yards each, and 300 packages of *sarees* averaging 4,000 yards each, a total of 3,920,000 yards monthly. The Bihar

and Orissa representatives placed their requirements at the same figure and the Assam representative estimated the requirements of his Province at 2,000,000 yards monthly. The majority of the remaining Provincial representatives expressed their inability to furnish a definite statement until they were in possession of samples of the cloth it was proposed to standardize and particulars of the price fixed for it. In some cases it was requested that a few bales of the standard cloth should be sent as early as possible to the local controlling authority in order that it might be ascertained from actual experience in regard to its disposal whether justification existed for indenting for it in large quantities. A sample of cloth which appeared suitable for standardization was submitted for the consideration of the Conference. This cloth, the specifications of which were 20-s warp and 20-s weft, 32 reed and 32 pick and the price of which in Bombay, if controlled, was estimated at about 5½ annas a square yard, was considered a suitable cloth for standardization and it was held that it would probably meet all the requirements of some Provinces and a considerable proportion of those of all Provinces. The opinion was expressed that it could be manufactured by all the mills in Bombay and most of those in Ahmadabad but not by those in Cawnpore.

THE INDIAN COTTON SEED CROP.

We take the following from *The Near East*:—

A summary of the article with the above title which appeared in the *Near East* on May 24, was telegraphed out to India, and has been the subject of the following Press *communiqué* issued by the Government of India:—

"Some days ago Reuter's telegrams contained an extract from the journal *NEAR EAST*, in which it was stated that two million tons of cotton seed were produced in India annually, of which two hundred thousand tons were used for planting and four hundred thousand tons were exported. It was added that doubtless a large proportion of the remainder was feed to cattle, which was an absurdly wasteful proceeding, whilst a considerable residue must be absolutely wasted. The journal regarded it as a standing reproach to commercial and industrial enterprise in India that a natural source of enormous wealth should be practically neglected.

"This extract is calculated to give a wrong impression of the real position in regard to cotton seed, and contains, numerous inaccuracies, which it is desirable to correct. Exact figures in regard to the production of cotton seed in India are not available, but an examination of the figures of outturn of cleaned cotton and of the percentage it bears to seed shows that there is reason to believe that an average annual production of 1,80,000 tons of seed is a liberal estimate. The average exports of seed during the last five years have been 151,595 tons only the highest figure being 284,327 tons in 1913-14. Cotton seed is regarded as a valuable feeding stuff in this country, and the inquiries of the Cotton Committee have shown that none of it is wasted, but that, on the contrary, it fetches a price of at least Rs. 2 to Rs. 3 per maund for feeding purposes. The Punjab

alone imports cotton seed to the value of nearly 50 lakhs per annum. Whilst it is possibly correct to say that it is wasteful to feed seed direct to cattle instead of in the form of cake, experience has tended to prove that the establishment of a large cotton seed oil industry in this country would not benefit the Indian agriculturist, who could not afford to pay for hydraulic pressed feeding cake the price that can be obtained by exporting it. The result of the establishment of such an industry might then be that the oil would be sold in this country and the cake exported, and that the agriculturist would be deprived of a valuable feeding stuff which, over large tracts of country, can be obtained cheaply from his own land or that of his neighbours."

The article to which reference is made was contributed by a valued correspondent, and it is regretted that it should have inadvertently contained an inaccuracy. What the brief summary of the article telegraphed by Reuter's Agency to India did not bring out was that the article was not couched in terms of destructive criticism, but was intended as a helpful illustration of one way in which it was believed that India's material development could be furthered. From the *communiqué* it appears that the writer was misinformed in regard to large quantities of cotton seed being wasted, and it is satisfactory that an occasion has been afforded for removing what might otherwise have become a general misapprehension. With regard to the other points raised, the writer of the article put the amount of cotton seed produced in India at about 2,000,000 tons, a qualification which may not improperly be held to cover the difference between the writer's estimate and the official figures. Then, as regards exports, the extract on which the *communiqué* is based quotes the writer as saying that 400,000 tons were exported. There were, as a matter of fact, three references to the subject, but in no case was any such definite statement made. It was stated that "it has . . . reached about 350,000 tons per annum," that, "according to Sir A. D. Steel-Maitland, M.P., 'the quantity of Indian cotton seed exported, chiefly to the United Kingdom, varies from 100,000 to 400,000 tons per annum, a slight increase of price being sufficient to bring forward largely increased quantities,'" and, finally, that "the quantity exported—as we have seen—has not yet exceeded 400,000 tons." The figures were in excess, but not to the extent imagined. There follows the question of waste in regard to which, as we have already pointed out, the writer's estimate was not in accordance with the facts.

Finally, with reference to the writer's argument that it is wasteful to feed seed direct to cattle, it is stated in the *communiqué* that "experience has tended to prove that the establishment of a large cotton seed oil industry in this country would not benefit the Indian agriculturist, who could not afford to pay for hydraulic pressed feeding cake the price that can be obtained by exporting it." Unfortunately it is not stated where this experience was gained; much depends on whether it was obtained on the coast or at mills in centres of cotton seed production. Suppose the milling to have been done on the coast, then the Punjab, for example, might well be unable to pay for hydraulic pressed feeding cake the price that can be obtained by exporting it, in view of the fact that it would have to bear, in addition, the cost of freight on a long railway journey.

BENGAL INDUSTRIES.

The Government of Bengal, in reviewing the Report of the Department of Fisheries, Bengal, and Bihar and Orissa, for the year ending March 31, 1918, say:—The investigation on Hilsa continues to present difficulties which have not yet been surmounted. Artificial fertilisation of eggs has been achieved, but it has not yet been found possible to hatch the eggs. The migratory habits of the fish and their delicacy add difficulties to the work of investigation. The most notable features of the season's work on carp are the increased distribution of carp-fry and the completion of the Delabagh experimental tanks. The numbers of fry distributed by the Department increased from 2½ lakhs in 1915 to 6 lakhs in 1916, and in 1917 there was a further increase to 11½ lakhs. As the demand has now been fully established, the director has rightly decided that in future the public should pay the cost of freight and earthen vessels as well as the cost price of the fry. It is hoped that the purchasers of fry will attend to the Director's instructions for keeping the fry in small shallow tanks until they grow large enough to have a chance of avoiding the attacks of predatory fish. The first attempt to stock the new Delabagh tanks was a failure, the fish taken from the Sone being attacked by disease. The object of these tanks is to provide a supply of fry which can be guaranteed not to contain any mixture of the fry of predatory fish.

The Dacca industries of button-making and Chank bangle-making are in difficulties, the former on account of the shortage and the latter on account of the high price of raw material. The work devoted to the raw material of these industries is therefore, of much importance. Three new co-operative societies of fishermen were established in Pabna district during the period under review the total number of such societies up to March 31, 1918, being 15. The difficulty of inculcating co-operative ideas into the minds of fishermen was noticed in the report of the previous year, and these societies will require unremitting attention. The statistics of fish traffic into Calcutta show imports of 301,254 maunds in the past year as compared with 317,146 maunds in the previous year. The quantity of fish imported is, however, largely in excess of that of any other previous year. The cold storage was provided on the East Indian and Eastern Bengal Railways dispense with the necessity for ice and should prove of great value to the fish trade. The result of experiments in introducing salted and smoked fish to the Calcutta market will be watched with interest.

CO-OPERATION.

Co-operation in War Time.

The importance of the work done by co-operative societies has been well illustrated in various countries during the war. In England the big distributive stores kept prices steady when private traders were inclined to lose their proper sense of discretion and by their well organized system of supply they were able to meet the demands of their members long after the ordinary shops had found the difficulties too great to overcome by individual effort. In a

recent number of "Better Business" an interesting account is given of "Irish Distributive Co-operative Societies under war conditions." It is claimed that in the early panic when the rush and scramble for food merely facilitated the charging of exorbitant rates, the co-operative movement was the only organization in the country able to counteract the rise in prices and to regulate supplies on a fair basis of needs; and further that without this steadying influence the unrestrained scramble and the consequent profiteering would have been much worse. When the sugar supply began to run short the co-operative stores practically rationed their members and kept prices at the old level until stocks were exhausted. The action taken to keep down the price of bread was strikingly successful: the stores sold the four pound loaf at ten-pence, while the price in some shops rose to one and four pence. This result was due to the refusal of societies owning and working bakeries to tolerate unfair prices. Throughout Belfast such action on the part of the United Co-operative Baking Society served to fix the price over the whole neighbourhood as private firms were unable to face the resentment which would have been aroused had they attempted to profiteer. The great advantage which the non-co-operative public have derived from the movement is that they have been able to see what a fair and proper price for an article should be, and so have exercised some control over traders consumed with the desire to exploit the situation. In Ireland, as in England, it is complained that Government failed to appreciate the work done by these co-operative societies and when control was introduced refused to acknowledge new societies formed to reduce prices to their members by distributing without profit. In one case, a society surmounted the difficulty by purchasing a local grocery business, including its allotment of sugar, etc. In another town where shopkeepers were charging a high rate for potatoes a society was started with the result that the local price fell to a half of the former level. The Punjab Publicity Committee's new paper "Haq" mentions a somewhat similar case in the hill station of Kasauli. When the local vendors raised the price of oil to Rs. 7-4 a tin, the residents formed a co-operative society which sold oil of similar quality at Rs. 5-6 a tin and forced the shop rates down.

AGRICULTURE.

Minute Subdivision of Holdings.

The Government of Madras have issued the following order on Minute Subdivision of Agricultural Holdings in the Madras Presidency:—

At the meeting of the Legislative Council held in May 1917, the Hon'ble Mr. A. S. Krishna Rao moved a resolution requesting the Government to consider the desirability of checking the minute subdivision of agricultural lands in this presidency. The Government accepted the resolution and undertook to consider the matter and to see whether any practicable steps could be taken in the direction suggested.

The opinions of certain selected Collectors, the Board of Revenue and the Directors of Land

Records and Agriculture have now been received. After a careful consideration of these opinions and of the papers connected with the legislation which is proposed in Bombay to prevent excessive subdivision of agricultural holdings, the Government are not prepared to undertake similar legislation, even in a permissive form, in this presidency at present.

Apart from legislation on the lines of the Bombay draft Bill, certain concrete suggestions have been made by the officers consulted. The chief of these relate to the abolition of the rules of preference contained in Board's Standing Order No. 15. This suggestion has already been carried out in G. O. No. 2,435, Revenue, dated 26th June 1918, and it is now open to officers dealing with darkhasts to take into consideration the desirability of creating economic holdings. The Government, however, agree with the Board of Revenue that the condition of impartiality below a certain limit cannot be imposed on lands assigned on darkhast.

The Board of Revenue is requested to consider the possibility of carrying out an experiment for the re-arrangement of holdings by consent on the lines suggested by Mr. Paddison in some typical villages in a district in which a special staff is engaged on a revision prior to resettlement.

EDUCATION.

FISHER'S EDUCATION ACT ON THE STATUTE-BOOK.

New Provisions Summarized.

The following is a summary of the main changes in the provision of public education in England and Wales:—

1. No exemptions from attendance at school shall be granted to any child between the ages of five and fourteen.

2. Local authorities may increase the age of compulsion by by-law to fifteen.

3. Compulsory day continuation schools shall be established for all young persons, unless they are being otherwise educated, up to the age of sixteen and after seven years from the appointed day, up to the age of eighteen.

4. The minimum number of hours of attendance at continuation schools shall be 280, and after seven years, 320.

5. No child under twelve shall be employed.

6. No child between twelve and fourteen shall be employed for more than two hours on any Sunday, or on any school day before the close of school hours, or on any day between 6 a. m. and 8 p. m. Exceptions may be made by by-law, provided that no child may be employed for more than one hour before school, and if so employed, for more than one hour in the afternoon.

7. Local authorities may make provision for the supply or maintenance of holiday or school camps, centres for physical training, school baths, swimming baths, and facilities for social and physical training.

8. Provision is made for the medical inspection and treatment of pupils in secondary and continuation schools.

9. Local authorities may establish nursery schools for children between the ages of two and five.

10. Special schools are to be established for physically defective children.

11. Fees in public elementary schools are abolished.

The Act also includes a number of administrative provisions relating to the duties of local authorities and the distribution of Government grants.

MYSORE ECONOMIC CONFERENCE.

PROGRESS IN THE DISTRICTS.

Chitaldrug.

AGRICULTURE.

Plants Supplied.—296 fruit plants were supplied to the ryots at Janukonda and Pandrahalli in Chitaldrug Taluk, and Hosadrag and Ballasamudra in the Hosadrag Taluk.

Instructions Imparted.—Instructions were given to the raiyats at Chitaldrug, Marikanve and Holalkere about manuring the fruit and flower plants and the kinds of manures to be used.

EDUCATION.

Reading Rooms.—Reading Rooms were started at Attegere, Hiretogonalere, Hebbal and Anaberu in the Davangere Taluk.

Collection of Funds.—A sum of Rs. 600 was contributed by the villagers of Kondaji, Harihar Sub-Taluk.

Shimoga.

An Agricultural Association.—A building estimated at Rs. 500 for the use of the Shikarpur Taluk Agricultural Association is under construction.

Pepper Cultivation.—In the interest of speedy development of pepper cultivation in the Shimoga District, it was resolved that the Agricultural Committee should be requested to secure sanction for the opening of a big nursery of pepper wine at Marathur in the Sagar taluk as early as practicable.

EDUCATION.

A School Building.—The people of Gajanur have constructed a building at a cost of fifty rupees for the use of the Panchama School.

New Schools.—Five day schools and one night school were newly started.

Additional Establishment.—The District Committee fully concurred with the Educational Sub-Committee's opinion and resolved to move the Inspector-General of Education to sanction, at an early date, the additional establishment required to keep up efficiency of the A. V. School at Shiralkoppa.

INDUSTRIES AND COMMERCE.

Mat-weaving.—Practical instruction classes in Mat-weaving have been stated at Muduvala, Mallapura, Cabbur, and Benavalli.

GENERAL.

Village Common Fund.—A sum of Rs. 721-4-1 has been collected as Village Common Fund in the Shikarpur taluk.

CORRESPONDENCE.

To—The Editor,
Mysore Economic Journal, Bangalore.

Housing and its relation to disease in Malnad.

Sir,—Among the many questions in the prevention of disease that are receiving the attention of reforming bodies is that of housing. When we consider the large percentage of time that is spent in the home, it is readily discernable that it is an important factor for or against the transmission of disease. A family that is indifferent in regard to the clearness of its home surroundings, quite willing to be ignorant regarding the laws governing its being in that home will add nothing to the prosperity of the human race. A nation, the majority of whose units are made up of such families will be a backward nation. The president of a great nation was born in a hut, but the conditions within and without that hut were the best possible. Poverty is but a small factor in this subject as the poorest can be clean and live in accordance with laws of sanitation and Hygiene even though it be in the most humble of dwellings.

In the consideration of housing conditions in this Province the country may conveniently be divided into sections, *viz.*, the villages, smaller towns and cities. The living conditions in each of these vary widely. In villages and small towns most of the houses are made of mud. They are huddled too closely together, are too few in number and are meanly built, having neither ventilation nor light. The village site is often lower than the ground surrounding the village and cultivation is carried on right up to the living quarters. Then, to add to this picture of squalor the stock is allowed to mingle freely with dwellers in the village. All of these conditions operating naturally, bring about results anything but Sanitary in nature.

In our towns we meet much the same conditions of overcrowding only somewhat worse as here the inhabitants live two, three, and four tiers deep. The houses although built of brick are located on some narrow alley 3 or 4 feet wide. This with the high buildings shuts out most of the light and ventilation and makes it extremely hot in the hot season. Here again the rooms built in these tenement houses are small, without adequate light and ventilation. Often one of these small rooms is occupied by a half a dozen tenants. Bad housing conditions make themselves felt by the spread directly and indirectly, of the infectious contagious diseases among which the most common are Tuberculosis, Typhoid fever, Dysentery, Plague, Small pox and Cholera. These are diseases that are spread by means of germs. The more closely people are huddled together, the more directly is the contagion spread. This is especially so in those diseases that break out in a virulent, epidemic form. The larger the number of people who are brought in contact with the one who is ill, the greater the danger from the contagion. This must necessarily be the case because of the direct social-intercourse that became necessary in these closely packed living quarters. The villagers have already learned the meaning of this to some extent as when an epidemic of Plague comes along they scatter to the fields in improvised places of shelter. The more thickly people are living together, the greater the number of victims claimed by a disease in a given time, and the harder to stamp out the disease. Indirectly bad housing tends to spread these infectious diseases by first lowering the vital resistance, thus throwing the body open to attacks from any one of them.

There are so many obstacles that loom up, that at first thought they would appear to form an impossible barrier against the improvement of housing conditions in malnad; that one makes suggestions along this line with great timidity. To tell a man that his house should be larger with windows and ventilators, but it should be located some distance away from his neighbour's house and he should keep his cattle out of his house, when he and his forefathers have lived this way for centuries, yes, ages, and since such changes bring about additional expense, and he does not see the necessity, would appear absurd. A man accosted in this way about such changes under existing circumstances might not go quite far enough to think that you have just emerged from a lunatic asylum; but his ideas of life are so vastly different from yours that he has to allow a great deal for you, while you are pitying him from the bottom of your heart.

Yet, if one became discouraged and dropped the matter here, centuries would pass by, and we would not be any further ahead than we are to-day. This is an instance in which the constant dropping of the water wears away the stone. It is a great encouragement in touring among the villages to see now and then man in a village who has acquired knowledge enough to build himself a house along fairly sanitary lines, and around which there is a nicely cultivated garden and fruit bearing trees. These instances are the outcome of the constant dropping of the water for the last ten years. The same good work of Education is bound to bring about multiplied instances of such progress. To allow each man in a village more rooms necessarily means that the village sites will have to be extended. This with the immense population of malnad will upset to some extent the economic conditions of the malnad country. But a careful and judicious tilling of the land already under cultivation will more than make up for the extra land that it would take to extend the village and town sites. This means that the wear and tear of the land must be kept up by crop rotation, plowing under of nitrogenous plants and the use of land dressing. Low, marshy waste must be thoroughly drained and high arid tracts must be fertilized, irrigated and converted into cultivated tracts. If the land yielding to its limit the amount of land needed for the extension of villages and towns would be made up for many times over. In the history of the past it has always been revealed that the adoption of the principles of sanitation and hygiene by a nation increased its efficiency in every line.

Another one says the people could not afford to extend their houses and make changes necessary to bring about such reform. Ragged dirty dhoties and clothes do not mean beggars. There is many a man in a village that has enough rupees buried beneath his miserable mud hut to build a dwelling good enough for any body. If this very day those who have sufficient means to bring about these reforms could be made to see the necessity, we could be a long way toward the solution of this great problem. This start would so increase the prosperity of the country that many of those now unable to make these changes would be able to in the near future.

In our towns and villages the same plan can be profitably carried out that is being inaugurated in England. Let every man in malnad lift where he stands. Let him not dare to shirk his duty in the matter of constructing houses under sanitary principles as the care of the public health is the first duty of the benign Government of Mysore.

K. C. EAPEN, L. B. SC.

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THE OUTLOOK IN GIRLS' EDUCATION.

BY SARA A. BURSTALL,

*Head-mistress of the Manchester High
School for Girls.*

AT this moment girls' education presents features of peculiar interest and importance; it is full of vigour and energy, given to it in part by the new belief in education which is at last beginning to pervade English opinion, but due also to that general social movement for adaptation and reconstruction which is itself the result of the inventions and discoveries, material and spiritual, that the last century brought us. Under the influence of this impulse, and of the need for correspondence with environment, with the conditions of life as it is, girls' schools of almost every kind are making new plans, trying new schemes, endeavouring to throw off old and harassing disabilities, to find out new ways of helping their children—are, in a word, alive. This growth and adaptation is encouraged by the fact that the higher education of women is itself comparatively new; it has been developed in the lifetime of the older women who are now managing it. Its traditions, therefore, while they are real and beloved, are not so rigid and oppressive as is the case in some centres of boys' education. Furthermore it feels yet the spirit of the pioneers: they whom we knew and remember and

reverence, women like Anne Clough and Frances Mary Buss, sought to satisfy the needs of their time by building new roads for the spirit of womanhood. We follow their example, so far as in us lies, not by doing exactly what they did forty years ago, but what they might have done to-day. Then they claimed, and rightly so, that girls should be admitted on equal terms to the inheritance of learning till then reserved for their brothers; we in the second generation, who have profited by some share in that inheritance, are beginning to consider how far our girls need something different in education from that which boys have long received. Some of us, like the present writer, think that the girls should be educated by other methods than the boys; that mathematics doesn't agree with every girl; that public external examinations are bad for most girls; that a girl needs a year longer at school than a boy to provide for her physical growth in a healthy way; that the type of discipline and influence she needs is quite other than what suits him: that sewing and gardening may be better recreations for her than violent competitive games;—and so forth.

Then again education to-day is profoundly affected by the new biological and sociological ideas as to evolution, heredity, the family, collectivism, the State, and the claim of the State on the individual.

THE TEACHING OF HOUSECRAFT.

We think more of the special duties of women to the community, of the basic value of the home in the State, of the long process

of differentiation between the social duties of men and of women. As a consequence, schools and teachers and administrators have for the last ten years at least been asking the questions, "What are the real differences between boys' and girls' education?" "How far shall we prepare our girls definitely for their special work as women?" Now nothing would be more foolish to suppose than that a few cookery lessons and hygienic classes would do this. No higher education can be too good for the mothers of the race; indeed we can never have an educated nation until the mothers are educated. But every woman ought to know something of housewifely arts. Nothing indeed is more remarkable in the modern education of girls than the growth of a new belief in teaching them so far as possible the principles and the practice of successful home-management in the limited sense of the term, housecraft, as the West Riding Authority, and the Joint Matriculation Board of the Northern Universities call it. Interest, inquiry, experiment in this direction occur everywhere. The women on Education Committees all over the country, most of them ladies with experience of social conditions and needs, have done much to promote such teaching, and are anxious to do more. They find that in this direction they can achieve something, since men everywhere believe in teaching girls to cook. Indeed the members of the local education authorities feel that public education during the last half a century has ignored an essential part of a woman's training for life, has assumed that the girl would learn in her own home how to manage the home for which later on she would be responsible, forgetting that she would be in school, her mother perhaps at work, and perhaps herself a bad manager. Now, public money is being spent in all sorts of ways familiar to every one; cookery centres for elementary schools, training colleges for domestic arts, like the

fine new one just being built for the Manchester City Council, housewifery departments in secondary schools for girls, flourishing evening classes and women's institutes giving similar instruction. Some of this new zeal is hardly according to knowledge, and much yet remains to be discovered and applied as to the proper place of these subjects in a girl's education. Detached cookery centres with elaborate equipment are not altogether satisfactory. We may yet see revolutionary changes in elementary schools, when some of the plans now being worked out in small and isolated experiments are more generally adopted. The curriculum, English, arithmetic, science, manual training, morals, all may be correlated and interwoven with the definite preparations for home life. Those secondary schools which are experimenting with housewifery departments and class are discovering much that is valuable. Such work appeals to many girls who are untouched by the more academic curriculum; more and more pupils desire to follow this course of study: parents believe more and more in the teaching. Schools do not go back on the road they have entered: indeed the domestic arts are becoming so popular that private finishing schools advertise that housecraft is included in their curriculum.

DANGERS AHEAD.

But, on the other hand, there are dangers ahead, which make many thoughtful women hesitate. In the first place, parents do not always approve. Many mothers can and do teach their daughters home arts in the home. "While my girl is in school, let her learn things I can't teach her," say they, and very truly. Besides, and this is a very serious question for the secondary school girl who is not well off, housewifery does not lead to a satisfactory and attractive form of earning a living, and is therefore avoided by the abler girls. To go to college and enter a profession such as medicine or even teaching, to prepare for the Civil

Service, secretarial work, or a business career, offers in a practical sense better prospects. This ought not to be: but it is, and to-day when parents expect their girls to earn a living, and the girls themselves desire economic independence, their education must have a practical aim. Tomorrow, let us hope, there may be better chances and opportunities for the skilled housewife to earn a good living. This possibility is connected with the development of university courses in domestic science and housecraft. A beginning has been made at the University of Leeds and in King's College, London. In America a good deal has been done, particularly in Columbia University, New York, and in the University of Chicago, but the problem has not been solved. Here, as there, the colleges and universities hesitate, as they have done about engineering and metallurgy, and other technical courses. The outlook here is full of interest and uncertainty. Ten years hence we shall have made some progress.

Lastly, we must note a feeling of anxiety lest this development of specialised education for home life might mean a surrender of much that has been won by the efforts of the pioneers, of that share in the spiritual inheritance of the race which has been opened us since the first women's colleges were founded. But, we venture to hint, the position of women in the intellectual world, the success which they have already achieved against serious odds, the value of their work to the community are too important and considerable to be endangered by the development of housewifery teaching. Such advanced instruction, if it is to be sound and thorough, is dependent on science, economics, and philosophy: the higher it stands, the safer will be the ground already won for the higher education of women.

THE ADVANCEMENT OF KNOWLEDGE.

As regards the highest function of a university, the advancement of knowledge, the

outlook for educated women is slowly, but steadily brightening. In the current report of the Federation of University Women is an impressive list of the published work of this character contributed by women during the previous year: an official pamphlet of the University of Manchester gives a similar though of course a smaller list of such work done by its women staff and by former students. This evidence is the more striking, as the existing provision of graduate scholarships and fellowships open to women is scanty and wholly inadequate, although for most of the posts at the new universities women are eligible. The Federation itself has managed to raise funds for two fellowships, one for arts and one for science. In the sixty-five years that have elapsed since the first women's colleges were opened in London there has been time for women to develop freely along the lines that suit them best in the highest education and in research. The life sciences, botany, zoology, physiology, and of course medicine, seem to occupy the largest place; next comes philosophy, especially on its sociological side, and including education, those applications of philosophy to the way men live. Next comes history and literature, including the classics, the record of man's spirit as it has expressed itself in language and in societies. The women professors and lecturers in English and Welsh universities have in general botany, education, history, literature as their subjects. In the future, with fuller opportunities for research, women will make further and larger contributions to knowledge.

As we have already said, the fact that parents in general are to-day determined that their daughters shall be qualified for self-support is the leading factor in girls' education at this moment. This is one reason, the chief reason, why the existing provision of colleges and public secondary schools is insufficient to accommodate the students who wish to enter. A degree qualification is for

a woman the gate to many of the more popular and desirable occupations, and consequently the pressure to enter college is considerable. Unfortunately scholarships for women are few in number and small in amount, and county major scholarships, though open to girls, are rarely gained by them. Since the demand for college education has increased so much, while the supply of scholarships is so scanty, excessive and injurious competition takes place among girls leaving school, in order to secure the means of that more advanced instruction which alone will qualify them for remunerative employment. Head-mistresses and those responsible for girls' education are seeking in vain for a remedy; but it is something at least to recognise the danger, and to see what causes it. Fortunately the new universities, with which the North of England is well provided, are available, and all the advantages are freely open to girls. As the character of the work done in these new centres of learning becomes even more fully recognised than it already is, their women graduates will be at no disadvantage in obtaining the highest posts. Something is also being done by the opening of new careers for well-educated girls, more especially in business. Some schools are developing commercial and secretarial sides, particularly in the great northern cities. In northern rural areas also special training for life on the land is being given for girls, in schools under local authorities, such as Knaresborough and Nantwich, while University College, Reading, offers to women special opportunities of a more advanced character in preparation for rural occupations.

WOMEN TEACHERS.

Meantime there is still a demand for women teachers, of the best sort. We want the ablest women we can get in the schools, and a great many more of them. When Labour wakes up to the fact that his child gets only one-sixtieth or even one-eightieth of a teacher, too often an ill-trained teacher,

while the secondary school child is declared least one-twenty-fifth of a graduate; and realises too that the child under thirteen needs more and not less attention than the boy or girl over thirteen who can work effectively alone—then we shall see a very large demand for teachers, most of them women. Parents will be wise to train their daughters for that national service, and administrators and the public generally will have to organize it so as to attract capable and able women.

It will be clear, we may hope, from the above what are the needs of girls' education to-day: more colleges at the old universities, more halls of residence at the new, and a plentiful supply of scholarships and fellowships at both; more teachers in elementary schools, greater freedom and initiative and experiment in practical courses of study: training colleges for housecraft, trade schools, and the improvement of the existing provision for evening classes; in secondary education relief from the pressure of examinations and scholarship competitions, freedom to differentiate, and for schools to supply the needs of their area. The secondary schools too must secure the continuance of a supply of able and vigorous women as teachers. "Men, not walls, make a city," said the Greeks; the modern version runs "Teachers, not buildings, make a school."

Mr. B. N. Dey, B.Sc., A. M. INST., C.E., an Indian engineer practising in Westminster, was appointed chief engineer of Messrs. Peter Lind and Co., Engineers and Contractors, and the Wear Concrete Building Company, Parliament Mansions, Westminster, in August last. Before joining this firm Mr. Dey was engineer-in-chief of another old established and big firm of civil engineers and contractors, where he showed his organizing ability and administrative capacity. He has carried out many engineering schemes in England.

CONSOLIDATION OF HOLDINGS IN MYSORE.*

BY DR. L. C. COLEMAN, M.A., Ph. D.,
Director of Agriculture in Mysore.

TWO obstacles stand in the way of the introduction of Agricultural Improvements into India which have not received that amount of attention which they deserve. There are (a) the small average size of the holdings and (b) their scattered nature, a holding often consisting of many parts situated at considerable distance from each other.

The Mysore Season and Crop Report for 1916—17 gives us for the first time, information as to the size of the holdings in the State. We find from the examination of the report that over 60 per cent of our agricultural holdings are five acres or less in extent, while over 85 per cent of them are ten acres and under. Some Districts show what at first sight appear to be much more unfavourable condition in this regard than others. Thus, for example, in Hassan District holdings five acres and under comprise 82 per cent and holdings ten acres and under, 93 per cent of the total.

An economic holding may be defined as one which is capable of supporting an average agriculturist's family without forcing its owner to subsidiary occupation to eke out his livelihood. Whether a holding is economic or not depends, however, upon many factors of which size is only one. The quality of the land and the climatic conditions are other factors of the greatest importance. There is, however, undoubtedly a minimum area beneath which it would be impossible for the average ryot to support himself and his family from the produce of his holding alone. Just what that minimum is in any particular District in this State, we are, I think, not in a position to

say but I think we shall be safe in saying that a holding of five acres or under is under our conditions very rarely an economic one. If this supposition is correct, we are faced with the serious fact that about all our agriculturists are attempting the impossible task of making a living on areas which are too small to support them and their families.

But the difficulties which face our agriculturists in connection with the question of land do not end here. Many, if not most, of the agricultural holdings in India, do not consist of a single block of land but are on the contrary, made up of small pieces scattered here and there throughout a village or throughout a number of neighbouring villages. As far as I am aware, no serious investigation of the extent to which holdings are scattered has yet been made in this State. I had planned an investigation in one or two villages near Bangalore but unfortunately circumstances have not allowed me to carry it out. To show to what extent subdivision takes place in India some cases investigated by the Hon. Mr. Keatinge, Director of Agriculture, Bombay, may be cited. In a village in North Canara, he found that a compact block of fifty acres was divided into 139 separate plots belonging to fifty landholders. The land was given up to paddy, sugar-cane, and cocoanut cultivation. One of the more substantial cultivators in this village cultivated in all twelve acres of paddy land. Of this, he owned three acres and leased nine acres. The twelve acres were divided into twenty-one different plots. Keatinge points out in his note the hopelessness of contemplating improvements in irrigation and cultivation under such conditions. I feel sure that we could find conditions very similar to this in the arecanut and paddy tracts of our malnad and in the paddy areas under many of our tanks and channels. In another village in the Ratnagiri District, Keatinge found an area of 30½ acres of paddy land

* Note as revised for the Agricultural Committee of the Mysore Economic Conference.

divided up into 49 separate plots which were owned by seventeen different cultivators. Of these seventeen, seven held their land in one block while the others had their holdings in from two to nine separate plots very irregular in shape and scattered all over the area. These are by no means the worst cases found by this investigator. In fact, in one case a landlord owning 48 acres of paddy land had it divided up into 53 separate plots. It seems highly probable, however, that conditions in Mysore are little if any better than those found by Keatinge, Mann and others in Bombay.

The difficulties arising from the small size of our agricultural holdings are such as cannot be easily removed but we must face the fact that they are now and will remain a serious hindrance to agricultural progress. Undoubtedly, however, these difficulties can to a considerable extent be overcome through the spread of agricultural co-operation in the State. Improvements in the cultivation of his land which the small cultivator cannot introduce while working independently he may be able to introduce if he works in co-operation with his neighbours. I shall not dilate upon this matter here as it will come up in another connection.

If we turn to the scattered nature of holdings there seems to me little doubt that a very great improvement is possible. This question has recently formed the subject of considerable discussion on the part of Economists and Agricultural workers in India and occupied a prominent position on the agenda paper of the Board of Agriculture at its recent meeting in Poona. Tentative schemes have been advanced by Professor Stanley Jevons of the Allahabad University, and Mr. Keatinge, Director of Agriculture in Bombay. Before turning to a consideration of these schemes, however, I think it would be advisable to consider what is being done in this connection in other parts of the world, for India is not the only country

which is suffering from the evil effects of scattered holdings.

Let us first of all look at conditions in Japan. Japan is pre-eminently the country of small holdings. 70 per cent of the Japanese farmers possess holdings of an area less than $2\frac{1}{2}$ acres while only 3 per cent possess lands more than $7\frac{1}{2}$ acres in extent. Moreover, almost 70 per cent of the cultivated area in Japan is in holdings of less than $2\frac{1}{2}$ acres, conditions which are apparently very much worse than prevailing in Mysore.

The agricultural holdings in Japan are also for the most part subdivided into small and irregular plots with an insufficient and sometimes irrational system of roads and often imperfectly and unsuitably irrigated and drained.

The seriousness of this state of affairs from the standpoint of agricultural production has not escaped the attention of the Japanese, and as long ago as 1899 steps were set on foot to remedy the evils attending subdivision. The first law for the readjustment of land was passed in 1889 and came into operation on the first of January 1900. The Japanese Government anticipated that through the consolidation of holdings an increase of 3 per cent in the productive area could be brought about by the utilization of boundary areas between adjacent plots while by the reclamation of land which also formed a part of the scheme a further considerable increase would be obtained. They estimated that the readjustment would lead to a total increase in the yield of the land of at least 15 per cent. As a matter of fact, in the first fifty farms which came under the operation of this Act, an actual increase in production of 38 per cent was obtained.

The operations connected with this work were not confined to consolidation and restriping of the land. This to the cost of surveying which is itself considerable where plots are small and numerous, had to be

added the large sums spent on canalization, irrigation and drainage.

Under this law the work of readjustment, restriping and the making of dykes, roads, etc., was entrusted to associations of landlords formed for the purpose. It also gave the right to carry out this work to individual landlords who furnished sufficient guarantees of ability to meet their engagements. With the object of facilitating such undertakings, the law exempted contracts from registration fees, made free grants out of *Crown* lands so as to facilitate the restriping and gave to competent authorities the right to fix in each individual case the indemnities compensating proprietors for losses suffered through the application of law, dykes, roads and embankments belonging to the State which became useless, were handed over free of cost but no compensation was paid for lands utilized for new ones.

Between 1900 and 1908 applications had been received under the law for the readjustment of over 2,600 farms of a total area of 3,50,000 acres.

Certain technical and administrative defects in this law came to light during its working with the result that in 1909 it was replaced by a new one. While the earlier law concerned itself principally with the utilization of boundary lands and the improvement of irrigation, drainage, dykes and roads, the new law while making provision for these, contemplated the reclamation of uncultivated land and the adoption of that kind of farming most suited to increase the yield and best adapted to the character of the soil.

The new law assigned the task of carrying out the work, chiefly to Syndicates formed among the landholders concerned and recognized as incorporated bodies. In order to obtain authorization to form such a syndicate, it is necessary to obtain the consent of at least half the land owners within the area in which the Syndicate intends to work on the further condition that such land owners represent at least two-thirds of the

area or value of the land to be readjusted. Special reductions are also allowed as a further inducement while money is supplied to Syndicates by the Japanese Mortgage Bank and certain other banking institutions at low rates of interest.

Under this new law within less than two years, applications had been received for the readjustment of 2,614 farms with area of 3,90,000 acres against 2,129 farms with an area of 3,50,000 acres for the eight odd years during which the previous law was operative. This indicates pretty clearly that the new law is meeting the needs of the Japanese agriculturists to a very remarkable extent.

As a result of the operation of these two laws, the cultivated area in villages where they have been in operation has increased by 10 per cent while the rise area has increased by 40 per cent.

With regard to the expenses involved in the readjustment, they have been, as already indicated, pretty high. For the first 490 estates under the first Act, the cost worked out at about Rs. 80 per acre. Estimates for the readjustment of 1,532 estates for which schemes were approved between the 30th June 1910, and the 31st August 1911, worked at the rate of about Rs. 110 per acre. The Japanese Government, foreseeing the difficulties arising from the large outlay, have granted special facilities in arranging loans, remitting taxes and granting large subventions which are administered by the Department of Agriculture and Commerce. From this it is clear that while the expenses are high, the benefits to be derived are such as to warrant them; otherwise it is clear that the Japanese Government would not show such marked interest in the furtherance of the scheme.

The question of the readjustment of the holdings has received much attention in many countries of Europe also, notably Russia, Austria and Switzerland. The procedure in each country has been very similar to that described for Japan. The Austrian Government has been particularly generous bearing in most cases about three-fourths of the expenses involved and the results in this country have been even more striking than in Japan. It is stated that in Austria the expenditure incurred has been entirely covered in two years' time by the increased annual yield. The expenses per acre in that country have been

very much less than those given for Japan varying from Rs. 3 to Rs. 7/8 per acre while the increase in value of the land has averaged over Rs. 100 per acre.

In Austria, readjustment takes place on the decision of half the landholders of a *commune* who must, however, own two-thirds of the land to be readjusted. For the initiation of the work involved in preparing estimates, etc., it is enough if the application is made by one-third of those concerned provided they enjoy one-third of the net revenue.

Enough has been said to indicate the general lines upon which legislation with regard to the consolidation of holdings has been framed and the results which have been obtained. It remains to consider whether the conditions prevailing here warrant us in expecting similar results in Mysore.

In the first place, while we have very little accurate information on the subject, I think there can be little doubt that our conditions with regard to the scattering of holdings are quite as bad as they are for instance in Austria although possibly not as bad as conditions prevailing in Japan. The same difficulties confront us here in the way of dividing up land among heirs as have prevailed in Japan and certain countries of Europe, and it is of course this which has largely brought about our conditions.

It seems to me that a consolidation of holdings would lead to certainly just as big an increase of productive area and possibly to just as large an increase in production as it has in Japan, and it therefore seems highly probable that it would be financially very profitable. However, we do not know what the expenses connected with such a consolidation would be and before we have an approximate estimate of this, it will be difficult to draw up any definite plans.

It has been proposed to have in each District a model Taluk. In each model Taluk I would pick out one fairly prosperous village for enquiry. I would then have a survey of the village made according to holdings, soils, irrigation facilities, etc. From this it should be possible to draw up an estimate of the cost of restriping and consolidation. Should the restriping prove possible from a financial standpoint and should 50 per cent of the landholders owning two-thirds of the land be agreeable, it might then be undertaken.

NICOTINE-PARAFFIN EMULSION.*

BY A. H. LEES, M.A.,

*Plant Pathologist, Agricultural and
Horticultural Research Station,
Long Ashton, Bristol.*

AS insect pests increase in number, and labour becomes scarcer and more and more expensive, the need for reducing the number of spraying operations becomes more urgent.

Broadly speaking, two classes of insect pests have to be controlled by the fruit grower—*i.e.*, those that obtain their food by chewing and those that obtain it by sucking. In the first case the plant material is eaten and solid matter enters the insect's stomach; in the second case the plant is sucked and only liquid matter is absorbed.

For the biting class of insect, such as the winter moth caterpillar, lead arsenate is quite sufficient. For the sucking class, such as aphids, red spider, apple sucker and capsid bug, it is necessary to use a contact wash. Contact washes usually contain soap, in order to give a certain amount of wetting power to the fluid. It is impossible to use lead arsenate with most contact washes, since a chemical reaction takes place between the two bodies, resulting in curdy masses and a loss of wetting and killing properties. A compromise can sometimes be made by combining nicotine and lead arsenate, but owing to the poor wetting power it necessitates much fluid being used with a high pressure behind it. This means, of course, great expense owing to the high price of nicotine. In addition, the great force necessary is the very opposite of what is required for lead arsenate spraying, where the desideratum is a misty application of the material so as to ensure the leaves being covered with a host of minute drops.

* With acknowledgments to the *Journal of the Board of Agriculture*. This should prove of the greatest interest to fruit-growers everywhere.

From these considerations it would appear that lead arsenate is unsuitable for use in a combined spray.

The only alternative to a stomach poison is to make the contact wash effective enough to kill chewing insects.

Nicotine by itself can be made to do this, but only at strengths that are prohibitive alike from danger of burning and expense. The first point, therefore, is to obtain some body or mixture of bodies that will greatly increase the killing power of dilute nicotine. To do this great wetting and penetrative power is necessary in order to carry the poison well into the insect's body through the breathing pores.

In the author's view the most satisfactory agent is a 2 per cent paraffin emulsion. Of the many possible emulsions of paraffin and soap this gave the maximum of wetting power with the least amounts of soap and paraffin and the least tendency to burn.

Its great wetting power may be judged by the fact that it thoroughly penetrates the white summer stage of American Gooseberry Mildew and the waxy threads of Woolly Aphis. Used alone this emulsion is capable of killing aphis and a good many, if not all, suckers. It penetrates flower trusses of the apple even if infested with suckers, and will wet leaves spun together by winter moth caterpillar if there is any way at all into the mass.

It is, by itself, a fairly good contact insecticide. It is not, however, potent enough to kill capsids, caterpillars, or beetles. Nevertheless, if $\frac{1}{2}$ or 1 per cent of nicotine is added to it its power is greatly increased.

The formula of the spray fluid is then as follows:—

Soft soap	...	...	20 lb.
Paraffin	...	...	2 gal.
Nicotine	...	...	$\frac{1}{2}$ lb.
Water	...	...	100 gal.

DIRECTIONS.

Dissolve the soft soap in 5 to 10 gal. of boiling water. Emulsify the paraffin in the

hot soft soap solution by taking up the paraffin in a garden syringe with a rose attached, a syringe-full at a time, and squirting it violently into the soap solution.

Add the nicotine and dilute to 100 gal. (i.e., adding 90 to 95 gal. as required).

For a 40-gal. paraffin barrel the formula is:—

Soft soap	...	...	8 lb.
Paraffin	...	...	6 $\frac{1}{2}$ pt.
Nicotine	...	...	3 oz.
Water	...	...	40 gal.

Stir the mixture well before use.

This mixture has been tried on the small scale against various insects and has proved successful.

Capsids.—These are killed where thoroughly wetted.

Cabbage Caterpillars.—The larvæ of the Large White Butterfly were sprayed with the mixture. They remained three days on the leaf motionless and fasting and finally died.

This treatment can be adopted where lead arsenate is unsafe for reasons discussed below.

Gooseberry Sawfly.—The fluid was tried against this larva at Long Ashton with satisfactory results. The effect is to cause all those hit by the fluid to fall to the ground. If thoroughly wetted they die, if only slightly wetted they recover and crawl up the bush again. It is advisable, therefore, not only to spray thoroughly at first, but after each row is finished to give a second spraying to the ground underneath the bushes.

This fluid is not intended to replace lead arsenate entirely in use against this pest, but only to be used when there is danger of poisoning the fruit, that is when the berries are to be picked green.

To test any possible danger of nicotine poisoning, fruit was collected from bushes sprayed with the fluid about a fortnight previously and analysed. Although a good

pound of berries was used for the analysis not a trace of nicotine could be found. The reasons for this are probably :—

- (1) The small amount of nicotine in the fluid.
- (2) The volatility of nicotine.
- (3) The small amount reaching the berries.
- (4) The washing off by rain and dew.

It may therefore be used safely against this pest.

Raspberry and Loganberry Beetle (*Byturus tomentosus*).—This pest has long defied treatment. The method usually advised is to shake the canes in the spring, when the beetle appears, over tarred sheets or into pans covered with tree grease. This is useless, since most of them remain in the flowers and tips of the young shoots, and can only be dislodged by picking them out. Nevertheless, this treatment, in default of a better, has been adopted in a certain plantation of logans in the Evesham district. With consent of the owners a trial of the nicotine-paraffin emulsion wash was given.

It was found that the fluid did indeed kill the beetles that were thoroughly wetted, but only sufficed to cause those slightly wetted to move elsewhere. Many substances will cause this beetle to appear dead, but in most cases they recover vitality and are no worse for their treatment. It is therefore necessary with this insect to keep apparently killed specimens at least a day in order to verify results.

It was clearly necessary therefore to perform one spraying to draw the beetles out into the open and to follow with second to kill them. In order to economise nicotine the first spraying was done with paraffin emulsion only, and this sufficed to penetrate their hiding-place and to bring the insects out into the open. This process took about five minutes. The procedure therefore adopted was to send one knapsack machine containing paraffin emulsion in advance and to follow after five minutes with a second

containing nicotine-paraffin emulsion. This method worked well. Three times, once a week, this double spraying was done and then stopped, as a slight scorching of the leaves took place which caused the foreman in charge to stop the process.

On a visit being made to the plantation it was found that the scorching was negligible and had done no essential harm to the plant.

When a count of berries was made the following result was obtained :—

Control.		
Infested.		Free.
42	.....	0
100 per cent.	.....	0 per cent.
Sprayed.		
Infested.		Free.
24	.....	49
33 per cent.	.....	67 per cent.

Considering that the plantation was very badly infested, that the spraying was stopped after three times, and that there was of necessity a large proportion left unsprayed, giving a large source of reinfection, the results may be considered satisfactory. No damage appeared to be done to the flowers by the fluid, and the set of fruit on the sprayed portions was normal. The damage to the leaves was negligible.

The treatment, of course, is not a cheap one, but the grower is faced with two alternatives. He may either do nothing and sell the very unsightly and infested fruit for jam purposes, in which case he only gets a nominal price, or he may give up loganberry growing and sacrifice his capital spent in plants, posts, wire, labour, and manure. For good quality and sound fruit, however, suitable for canning, a remunerative price can be obtained, and in the case above described the owners were willing to go to any reasonable expense in order to get such fruit.

At the present time it is impossible to give an estimate of the cost of the fluid, since prices are abnormally high and constantly increasing. Indeed, some of the substances may be unobtainable for spraying purposes.

Nevertheless it has been thought worth while to publish these results in order that anyone in a position to do so may have the opportunity of trying the mixture. It should be pointed out, however, that not any paraffin emulsion is suitable, but only that having the formula as above. Those containing less soap do not have sufficient wetting power, and those having more paraffin are liable to burn.

INSECTICIDE AND FUNGICIDE.

In addition to the insecticide nicotine the emulsion may be made to carry fungicide as well. Not every fungicide is suitable for inclusion, but only those which contain salts of ammonium, potassium, and sodium. Other bases precipitate the soap, causing clogging at the nozzles and destruction of the wetting properties. Liver of sulphur, sodium sulphide ("soluble sulphur") and ammonium sulphide may be used, but *not* lime sulphur, Bordeaux or Burgundy mixtures.

So far only liver of sulphur has been tried, and the results obtained by Professor Barker and the author against American gooseberry mildew, and published in this *Journal*, (March, 1916), were satisfactory.

In this case, being intended only against a fungus, no nicotine was added. There is nothing to prevent the mixture being used with nicotine added, as a combined insecticide and fungicide. Used on fruit trees just before the opening of the flowers, it should serve to control aphids, suckers, capsids, winter moth and, possibly, brown rot and scab.

WARNING.

It has recently been shown that though nicotine itself is safe to use on fruit that will shortly be eaten, since it is extremely volatile, nicotine sulphate is not. This salt of nicotine is not volatile, and therefore remains on the fruit for a considerable time.

If the above spray mixture is used on gooseberries the grower should be sure that he is using nicotine and not nicotine sulphate.

INDUSTRIAL REVIVAL IN INDIA.*

BY SIR THOMAS HOLLAND, F.R.S.

I have been asked by His Excellency the Chancellor, in addressing you to-day, to indicate some of the ways in which the University can take a greater share in assisting the industrial revival of India—a movement to which in spite of his impending and much regretted departure from India, he is as keenly devoted as ever. His Excellency the Viceroy also regards this question as one of the most important among the by-products of the system of reforms which he hopes to see inaugurated during his term of office.

India has to be prepared in the near future for two great changes—(i) the acceptance by Indians of a greater share in the administration of the country, and (2) an equally important forward move in industrial development. These reforms are necessarily complementary, and neither will be of permanent value without the other. Both, the successful, will require the training of young Indians in great numbers, and for this work we must rely largely on our Universities. Recommendations have just been made by the Industrial Commission in the hope that in the near future India will become a still more important unit in the Imperial federation self-contained in men as well as in materials. But to secure this end we want not only the energetic initiative and co-ordinating influence of Government, but independent enterprise, especially on the part of the University Graduates, who have received a foundation in education that should enable them to add to the productive capacity of the country.

In spite of our varied personal interests and in spite of the differences in our points of view, my colleagues are unanimous in our supreme object to find a scheme which if

* Extract from Address delivered at the Madras University Convocation 1918.

undertaken with energy and sincerity, will help towards our ideal of "an India, strong in her own strength, and a worthy partner in the Empire"—that great Empire which has now emerged stronger than ever from the greatest war that the world has ever known, simply because every constituent of the Empire has made some sacrifice for that it knows to be a righteous cause.

We all know that there are two ways by which one may walk from the east end of a church to its western tower, and generally there is little to choose between the northern and the southern routes. But if the two athletes discuss the relative merits of the two, whilst a cripple hobbles off, possibly by the less desirable of the two routes, the cripple gets to his destination before the athletes have even started. So too there are alternative schemes for industrial recognition; we have chosen what we think to be the one most likely to effect an early start, and one which will admit of modification, not by further discussion so much as by actual trial under conditions of mutual co-operation between Imperial and Provincial Governments, between Indian and European, between employer and employed. Somebody must choose, as somebody must lead if we intend to move at all and to avoid anarchy. There is an old saying, "where two ride a horse-back one must ride behind."

You have heard much recently about schemes for political reform, which have been designed to give Indians a fuller share in the administration of the country. But reforms in methods of administration must ever be disappointing and barren unless we can find the men who are capable of undertaking administrative as well as executive duties; for administration is an art that requires an apprenticeship and practical experience as much as carpentry or any other form of technical trade. As to whether industrial reform or political reform is the more important is as much worth discussing as the relative value of the brain and the body.

Neither can reach its full productive value without the help of the other. Whatever be the phase of reform, whether industrial or purely political, the nature of the education given to our young men must determine its practical value. Education has proved itself to have a more powerful influence on the individual than other tradition or heredity. In two or three generations education has changed Japan from a primitive nation to one industrially advanced in most forms of civilised culture. In about the same period, by concentrating on any one selfish idea, education has debased the German character and brought about the ruin of great nation.

In discussing schemes for the industrial regeneration of India, you will notice that the Commission has given emphasis to the necessity for education as much as to the co-ordinating administrative machinery, to facilities for finance, or the healthy and enlightened treatment of labour. We have urged the necessity of primary education for the worker as much as scientific and technical education for the supervisor, the manager and the so-called captain of industry.

Now it is here that the influence of the University comes in. If Universities are to retain their value in any civilised and developing country, they must, like business men, adopt their methods to the growing needs of the community. To what extent the Universities, by moulding the form of education can contribute to the cause of industrial progress will depend on their recognition of the fact that practical appreciation of the physical sciences is of fundamental importance to every modern form of industry. Judging by statistical results, this University, like others in India and most of those in England, has failed hitherto to keep up with the requirements of the times. All Universities seem to be slow in recognising that in complexity and volume, science is rapidly exceeding all other forms of culture, and that unless provision be made for specialisation, science may be more a

danger than a help in industrial enterprises. Like the ordinary newspaper with regard to prejudices of its readers our Universities have too often played to the tastes of the majority of its students rather than attempted to mould their tastes so as to qualify them to meet India's urgent demands for the qualified technical men required to deal with its abundant raw materials.

It must be admitted that an examining University is less advantageously situated than a teaching institution to assist in the task of moulding the tastes of its Undergraduates: there is not unnaturally a tendency for his functions to become restrictive rather than directive—to accept the role of policeman rather than that of preceptor. Judging by the large percentage of failures among the candidates for degrees, the process of preliminary weeding is less efficiently performed by our affiliated colleges than seems desirable in the interests of education. The policeman who comes into practical contact with the offender more frequently than with the well-behaved citizen is not likely to form a high appreciation of the value of precept in moral ethics. If our colleges could undertake more of the work of sifting that seems now to be thrust on to the University examiners, the University as a body might devote more of its energies to the development of scientific research, and the recognition of those post-graduate workers in science whose merits in contributing to useful knowledge cannot well be assessed by mere examination.

It is not yet practicable to do without the examiner any more than without the policeman; both seem still to be necessary evils, but their activities—or, if there is such a word, their negativities—require supplementing by more positive influences if the University is to become here, as it is now in England and even more conspicuously in America, an incentive to progress in those physical and technical sciences that form the foundation of industrial progress.

Until however, we take care to provide something better, we must be careful to support our existing system of education by examination. As Dr. Walker aptly reminded the Science Congress at Lahore, unless we provide an equally good substitute, we might come under a judgment like that given by a certain Persian monarch who, having to adjudicate between two poems, and having one of them read to him, promptly and without further investigation, awarded the prize to the other.

It is difficult, as Emerson said, to lay stress on any one truth without apparent injustice to another, and it would be unfair to preach to any University as if the want of progress were due only to its shortcomings. Education might be the chief industry of the whole nation—"primary education" of a kind that makes the workman prouder of himself and his work, able to earn and wise to spend better wages; "secondary education" made accessible to those workers who have the ability and ambition to lead and supervise their less gifted fellows, and the "higher forms of technological science," necessary for that development of new and improved processes which are suitable for local application and are necessary if India is to preserve her just claim to equality among the great dominions of the Empire.

It is the importance of this development of post-graduate training which I wish especially to prove to be essential in order to meet our ideal that India must become self-contained in men as well as in materials. And just now because of the conditions arising out of the great war, this question is of vital and specially urgent importance.

It is impossible to overestimate the value of scientific research in dealing with the raw products of India. Until we know more about their nature, it is impossible to turn them to industrial account. There is an enormous mass of material in India awaiting investigation and an unlimited field for post-graduate research work. India loses millions yearly

because its raw materials are exported in an unrefined or unmanufactured state. Money spent wisely on research work cannot fail to be a good investment. We are often told that the natural products of the tropics must inevitably give way in competition with the artificial products of chemical science in Europe. That is not my view. The destruction of the natural indigo industry and the importation of European sugar into a country where the sugar-cane is an indigenous weed are quoted as examples of the way in which modern science will beat Nature in the tropics.

But science is not the monopoly of Europe and it is applicable to natural as much as to artificial products. What science has done in spite of the European climate, in improving the productivity of, for example, the sugar beet, it can do also in India with the help of tropical conditions. The processes, however, that apply to European products, whether natural or artificial, are rarely applicable unmodified to Indian materials. We must work out and improve processes suitable to our own local conditions. The principles of science are universal, and are as much available to us in India as in Europe; but their successful application necessitates research here on the spot, with our own materials and under our own conditions. We want therefore in India something more than students who can pass examinations in the principles of science, or who have been made familiar with the technical processes that are successful in Europe; we want a large body of men who are able to establish new principles and to work out those processes that will give the best results under Indian conditions of growth, of manufacture and of market.

The time, as I have said, is now ripe for a very special and definite step forward. The great war has cut off the finest among your men who would have been ready to come out and assist in the development of India. We want you young men to take

their places in the services, in industry and in business. Those of our young Englishmen who have come through the great ordeal alive, will be wanted for the task of reconstruction at home. It is for you, therefore, whose security has been purchased by the lives of others, to show that you can undertake a share in that industrial regeneration of India which is necessary to make its political advancement effective, permanent and secure.

We have had in India during the past few years striking illustrations which should be sufficient to make even the most pessimistic realise the way in which applied science can affect the productive capacity of the country. Mr. David Clouston's experimental work on cotton-growing has produced a breed of cotton that is best suited to the conditions of Berar, and its adoption has added more than six crores to the income of the ryots in that minor Province alone. Equally dramatic results have been obtained in wheat growing in North India.

One has to remember that relatively small improvements in agricultural methods produce enormous totals in a country like this where agriculture is the chief and most important industry. In England an acre of land produces on an average three times that of the average in India. If, by more extended application of scientific agriculture, we could bring the Indian average up to only half the English output, the gain to the country annually would exceed the whole of the recent war loan about which so much fuss was made.

These are merely examples to show what enormous benefits we lose by insufficient workers in science; one could easily multiply such illustrations. But in addition to the necessity of increasing our food supplies, the war has shown the necessity of producing in India a larger variety of those materials and articles which are essential to insure the maintenance of essential civilised activities. But for the protection effectively maintained

by the British Navy, India would have been absolutely isolated for four years during the war, and its industries and internal communications by rail and telegraph would have been paralysed for want of materials and articles that, under present conditions, cannot be manufactured in the country. The war has taught us the necessity as a national security of manufacturing our own chemicals, of smelting our own metals and of making those articles which by constant use have become public necessities. Under present conditions not a telegram can be despatched, not a tram or train can be run without the use, not only of imported articles, but of imported material from which those articles are made. If at any time England became, by preoccupation elsewhere, unable to supply the essential wants of India, the country would be paralysed. Surely, it is the duty of everyone of us, English and Indian, to co-operate for the early removal of this danger to the three-hundred million fellow subjects for whose safety we are responsible.

During the last two years we have learnt to manufacture numerous articles that were formerly imported as a matter of course, and in this effort we have received as much help from Indian as from English firms. I find, on analysing our accounts for the last quarter, that considerably more than 60 per cent of our payments for war stores alone was paid to purely Indian firms, many of whom have now had a start which will enable them to retain a permanent position in the Industrial world.

But the small progress that we have made under the special conditions of the war merely throws into painful relief the size of the task which must still be tackled and mastered before India can be assured of internal safety during another such period of isolation. You will find a chapter of the Industrial Commission's report devoted to a list of the essential or so-called "key" industries, which must be established in India

before we can be sure that the country can be regarded as relatively safe during times of international troubles. Practically every essential form of raw material is here; what we want most urgently are men in sufficient numbers trained in science sufficiently to turn the raw materials into consumable form.

I wish it were possible to bring home to your teachers a full realisation of the fact that the road to Tipperary of the soldier's song is very very short compared with that which has to be traversed before we can hope to produce a sufficient army of young men capable of undertaking the scientific and technical work necessary to turn our abundant raw materials into the articles that are essential for the bare safety of India.

We need not yet stop to discuss the relative merits of workers in theoretical and applied science; there is not so far enough of either sort available in India. Nor will any form of artificial stimulus be of the slightest use, not even that economic intoxicant known as a protective tariff, until we see our technical laboratories taught by students of the same high mental quality that now crowd our class rooms for literature and law.

Responsibility lies with the student as much as with the teacher, the University or the Government. Technical efficiency is not acquired by memorising copy book maxims but by the earnest study of the principles of science in the atmosphere of the works. Students here, as at home, now show an increasing willingness to accept the discipline of the workshop in order to complete their education, in the one way necessary to secure technical efficiency. But there is much lost time to be recovered in order that newly acquired political responsibilities may prove to be justified and supported by substantial economic progress. It is among the graduates of to-day that we must hope to find those who are fit to lead in

industrial enterprise and to undertake the work of administration.

To make your country richer and stronger is an object worthy of your best effort. We want our students to be assets, not liabilities, in the national balance sheet, "Our grand business," as Carlyle said, "is not to see what lies dimly at a distance but to do what lies clearly at hand," not to dream political dreams, but qualify for public responsibilities.

The essence of the lessons which I wish to impress on you to-day is this: India is on the eye of a great move forward; the country is about to undertake new political privileges which can necessarily carry with them corresponding responsibilities. The most obvious practical need of the country is now young Indians in greater numbers capable of undertaking administrative duties as well as industrial enterprises. Administrative work requires an apprenticeship and training as much as any technical art, while all modern industries are based on a foundation of science and technology.

If the Universities retain the mobility that should characterise every healthy organism, they will recognise in time and will arrange to provide the kind of training that is most necessary for young men to serve their country and the Empire efficiently.

The new political privileges foreshadowed will necessarily remain barren and ineffective unless supplemented by equally important industrial reforms. The Universities, recognising this, should provide greater facilities for practical training in science and for post-graduate work in scientific research, especially on the raw materials of the country. The taste for science must, however, be formed in the schools and colleges; but there is obviously something wrong with a system which results in the annual presentation, through affiliated colleges, of more than twice as many candidates as the examiners find to be suitable for degrees.

It is the duty of all who are responsible for the education of our young men to meet the requirements and responsibilities necessitated by the new reforms which every true patriot wishes to make a success.

THE COTTON TRADE OF INDIA.

BY C. GOPAL MENON,

Member, Madras Port Trust.

OF the numerous products of the soil nothing is more important to the civilised world at the present day than the downy fibre or wool-like covering of the seeds of the tropical genus of plants known under the name of cotton. There is nothing except food itself, which is of so much material consequence to the well-being of this country as an abundant supply of cotton goods and any dearth of the supply of this material for clothing would give rise to the unhinging of the human mind as of food-stuffs. It forms a principal article among the merchandise which India annually exports. In the quinquennium ending 31st March 1914, our exports of grain, chiefly rice and wheat, amounted to 30'50 million £; cotton and cotton manufactures 29'79 million £; jute and jute manufactures 28'30 million £; seeds 16'24 million £, and so on; raw cotton alone exported at this period shows a record of 22'18 million £ and on 31st March 1917, it is 22'76 million £. Within the last two decades, the general export of raw cotton from India has been more than doubled. In Asia, and many parts of India, cotton has been cultivated from time immemorial. The plant is indigenous to Africa, and its cultivation has long been carried on with profit in Egypt. Egyptian cotton is used for making finest fabrics such as muslins, sewing cotton, etc. The indigenous cotton of Berar is of an excellent quality. Madras and Surat is the commonest of all cottons, being used only for coarse-cloths and other articles of great bulk and little value; cotton is also cultivated as an irrigated crop in the provinces of Sind and the Punjab. In Sind, the cultivator has to depend entirely on irrigation canals. American and Egyptian cotton of

good quality and yielding as much seed cotton as the indigenous variety can be grown, but the area is restricted by the supply of water for irrigation purposes.

But the most important point in connection with the cultivation of cotton in India to-day is the rise into prominence of a recently discovered type called "Cambodia" cotton. It has a full inch staple, is uniform and glossy, of fine fibre and somewhat creamy in appearance; it is a heavy yielder and grown on the "red" soil of this Presidency, which, so far, has not been used for cotton. It has been estimated that in the next ten years' time quite 1,000,000 bales of this cotton will be produced in the South of India.

As regards the distribution of the Indian crop, the significant fact to notice is the growing importance of the demand from the foreign markets, particularly from England. Europe has been and always must be dependent upon other quarters for a supply of cotton, her climate is generally too cold for the cultivation of the plant. In India itself, it is only the coarser types of indigenous cotton that has been used for spinning, a large part of the better varieties being exported to the manufacturing regions of Japan. As regards exports to Europe, a great deal is purchased here by the large firms and shipped by them on their own account. It might interest people to know that cotton is grown in Russian Central Asia but solely for Russian consumption. Sea Island Cotton in the West Indies, is used for making articles similar to those for which Egyptian cotton is employed. China produces cotton largely for home consumption. Cotton has been imported into England from Brazil since the earliest days of the industry. Brazilian cottons are in good repute, the chief of which is the Pernambuco, which enjoyed for a long time the reputation of being superior to any other than Sea Island or Bourbon. India always came forward to supply England with the

raw materials which she required upon an enormous scale. When the Russian War seriously interfered with the supply of hemp to England, India supplied its place with Jute and Sunn. When British forests were found insufficient to supply the dockyards with timber, India gave them "teak," and when the Civil War in America deprived the world, especially Manchester, of all cotton supplies from the blockaded Southern States, India's exports of cotton (1860-65) to England took a remarkable turn. It was at this period that an impetus was given to grow and export the raw material with much profit and several of the Bombay merchants whose descendants to-day are some of the merchant princes of that city made their fortune in trade at that period. India successfully maintained her position for several years, the best known was the Surat, a name given to the varieties grown in the various districts round Gujerat. This quality was subsequently superseded by "Fair Dhollera" and "Broach". The cotton tract in the valley of the Godavery is a great producer of cotton, and Gujerat, under the present demand, is expected to send forward, about one-fourth of the total supplies from India. What is required in India in order to improve the quality of the cotton is to materially increase the productive power of the land.

India's principal industries are those engaged in the manufacture of cotton and jute products, leather, silk, wool, paper, sugar, indigo, tea, coffee and tobacco. The only industry which comes into competition with Lancashire is the cotton industry, although India itself is the best customer of Lancashire in cotton goods. The cotton trade of England, and the greatness it has attained was hardly dreamt of in the earlier periods of her commercial history. The birth place of cotton manufacture was India, where it flourished long before the date of recorded history. Herodotus, Strabo, Pliny, Marco Polo and other classic writers have

borne witness to the quality of the cotton fabrics of India. It is believed that Indian cotton reached the European countries *via* the Levant, but the first recorded importation of cotton into England was in 1298. At first the cotton industry in England made slow progress. There was no attempt at organization, the industry being carried on under the domestic system.

The machinery used at first was of the most primitive kind. The Indian methods of spinning and weaving were also rude, but, James Forbes in his *Oriental Memoirs*, says, that no people possessing a physical organization less exquisitely adapted to give manual dexterity than that of the Oriental, would have been able to work raw cotton into a fine cloth by the same process. The mechanical inventions of the latter half of the eighteenth century enabled the Western nations to compete with and greatly surpass, the Hindus. These have also given to the cotton industry an unparalled extension in Europe and America. The natural and physical advantages of England for this industry are superior to those of any other country and Lancashire is the district where these advantages are most met with the plentiful supplies of coal and iron enabled her to take full advantage of the mechanical inventions of spinning and weaving. Further the wars which had been raging in Europe, and which continued until 1815, enabled England to secure the dead among the manufacturing countries of the world.

At the time when East India Company established their factories in India, she had a large overland trade with the East and the articles sent out were many and varied. Cotton goods, of course, formed the most important article exported from India. In the latter part of the seventeenth century and the beginning of the eighteenth, such considerable importation of Indian calicoes, muslins and chintzes were made, to excite the vehement opposition of English manu-

factures, and to lead Parliament to exclude these goods by heavy penalties. The jealousy felt in England was not so much on behalf of Indian cotton trade, but of the woollen and silk manufactures, which goes to prove that no cotton goods were then made in England of the fine and light qualities of those from India. It was in 1781 that the East India Company first directed its efforts in India to the promotion of the growth of cotton, and to the improvement of its quality. In the same year was made the first shipments of Indian cotton to England. In 1814 exports to England amounted to 4,000,000 lbs; in 1861, 369,040,448 lbs., and to-day our exports of the raw material rose to the magnificent figure of £22 million. To the year 1760 the machine used in the cotton industry in England were nearly as simple as those in India, though the hand-loom were more strongly and perfectly constructed. Between 1770 and 1800 the character of the industry was completely revolutionised, with the amazing result of overproduction. These found their way to the Indian markets and her hand industries could no longer face the struggle with the articles made by the modern complex machinery. Consequently, all industries crippled in India and the people devoid of skill and experience, with scarcity of capital, lack of machinery, and want of co-operation, had to fall back once again on agriculture. India, once famous for its manufactures of the most delicate fabrics of the world, has become a purely agricultural county, exporting food-stuffs and raw materials. Whereas, England with its industrial revolution and consequent expansion of machinery manufacture, has specialised in the production of cotton goods, M'Culloch, in his *Principles of Political Economy*, says that, "it was the rapid growth of the cotton manufacture that bore us triumphantly through the contest with revolutionary France, and gave us wealth and power sufficient to overcome the combined force of almost all

Europe, though wielded by a chief of consummate talent."

Simultaneously with the growth of cotton manufactures in England, there has been a similar growth and expansion, especially in the United States and Germany, which countries, however, do not rival England for supremacy. England has a monopoly in spinning the fine counts, *e.i.*, fine, thin yarn, and this is the most remunerative branch of the industry. In the spinning industry, the basis of measurement is the number of spindles, and we find the following figures as the latest tabulation from which it will be observed that although India has been specially favoured having the supplies of raw countries immediately to hand has been the birthplace for cotton industry, she lags behind very much as compared with other countries.

England	...	55,971,501	Spindles.
U. S. A.	...	31,519,766	do
Germany	...	11,404,944	do
Russia	...	9,111,835	do
France	...	7,400,000	do
India	...	6,397,142	do
Austria	...	4,941,320	do
Italy	...	4,600,000	do
Japan	...	2,414,544	do

Total ... 144,704,012

I shall take a survey of the progress of the cotton mill industry in India. India's first mill was built in 1851, and Calcutta claims the honour of having built the first mill. In 1870, she possessed only 13 cotton mills, while at present there are about 230. In the year 1883, there were 74 mills with 15,251 looms and 1,895,814 spindles and from the recent figures published by the Department of Statistics for India including Native States show the number of looms to be 108,417 and spindles 6,695,688. The production of piece-goods in the Indian mills, which was in 1896-91, 9 million lbs, in 1907,

181'3 million lbs, rose to 237'73 million lbs in 1916—17. The 230 mills at work included 98 spinning, 13 for weaving and the remainder both for spinning and weaving. Bombay Presidency is the principal district occupied by the industry. The total output of cotton goods by the Indian mills only amounts to about one quater of the imports. The chief difficulty is in the production of higher counts of yarn. The industry is not aided by protective tariffs. The Japanese competition is also being increasingly felt now. It is time for patriotic men to consider the future state of this industry. To a great extent it will depend on the experiments now being made to improve the raw cotton grown in India. The views of the Indian Cotton Committee appointed by the Home Government which has taken evidence of the trade in the country is also awaited with regards to that extension of long stapled varieties. It must also be said that the Agricultural Departments of the Government of India and of the Indian States are doing excellent work on a scientific basis. By seed collection they have developed long staple indigenous cotton, and in some parts of India American seed has maintained its characteristics for several years. One difficulty, however, is that of persuading the peasant farmers to improve their methods of culture. Another evil to which our suppliers of cotton often resort to is adulteration. Owing to the lowering of the quality the fineness of the cotton is very much reduced. These and other matters should receive the earnest attention of those who are responsible for the carrying on of this premier industry in this country. It should be the duty of the custodians of this industry to see that more of the raw material now exported is converted into manufactures in the country. New phases of this industry will crop up immediately after the war; new economic problems are certain to arise and unless they are courageously met by the opening of more mills for converting the raw cotton produced in the country, the old order of things will continue without finding any solution for the reconstruction of this industry on a more solid and permanent basis. May I suggest to patriotic Mysoreans to lose no time in starting mills in their own area?

THE VALUE OF WATER IN WAR AND PEACE.

BY PROF. SHIV NARAYAN, M.A., B.Sc.,
B.E., MEM. A.T.E.E.

WATER, which is well recognised as a vital necessity of all life and an economic good of the first importance, is the topic of the day. The war is responsible for bringing into prominence a thing of daily use, which seems to have received inadequate attention merely because it was so common. Objects which we become familiar with lose their interest and importance after the first impulse to investigate and utilise them (if possible) is past. It is the rare, the remote, the recondite that humanity rejoices in. Its instinct of curiosity prompts it to seek out new regions, to think out novel conceptions and to dream of better worlds. Not that nothing good comes out of such an instinct. It may rightly be said to be the mother of adventure. To it must be credited the discovery of what has proved to be the saviour of higher ideals for humanity—America—by Columbus, who, as is well-known, had set out to find India and failed to do so,—but what a magnificent failure was his! To the same spirit we must attribute the repeated attempts and the crowning success of the American explorer Peary who was the first to reach the North Pole, though another adventurer—a countryman of his called Cook whom several people considered a crook—also claimed that honour. This spirit has been likewise the harbinger of a host of scientific discoveries and inventions *e.g.* Newton's laws of gravitation, Archimedes' principle of hydrostatics, Faraday's principle of electromagnetic induction and laws of electrolysis (on which are based practically the whole of modern electrical engineering), steam railways and ships,

automobiles and aeroplanes, wireless telegraphs and telephones, X-rays and Radium, etc. etc. Curiosity in fact is not only the mainspring of research but also the source of inspiration. Scientists and Poets alike depend on it for their work. It is one of the secrets of sustained success in all spheres of human thought and activity. But while we must look before and after for what we have not, let us not look with disdain upon the commonplace in our hankering after the extraordinary, let us not pass it by in disgust. Common objects—aye, ugly and dirty ones—can be turned to good uses, as all those acquainted with agriculture or medicine can testify. Engineers and industrialists know that waste materials, waste heat, even smoke and dust, are utilised to good purpose in several industries. If this is true of such things, it is all the more true of pure and clean objects like water, whose many-sided usefulness is only now beginning to be appraised at its proper value. We have always wanted it, as witness the establishment of cities and sacred places near rivers and springs and their consequent prosperity compared with that of dry tracts of country.¹ But new values of water have been found, which deserve to be recorded.

Take the case of the great war itself. It is the bare truth that the Allies won, mainly because they were undisputed masters of the wide waters of the world. The side that was ever supreme on the sea—though sometimes subjugated away from it—finally succeeded in the stupendous struggle. Early in the war Germany withdrew from the surface of the waters. Her proud navy was paralyzed at the outset. Her sailors were so many idle hands in her harbours,

¹ Modern cities receive their water supply from reservoirs which are sometimes situated many miles from them, *e.g.*, the Tausa lake which supplies Bombay is 8 miles from Atgaol Station, 59 miles from Eombay. The Catakill Aqueduct extending from the Ashokan reservoir, which mainly supplies New York, is 80 miles long.

which became, for the nonce, devils' workshops. The Empire that was mightiest from a military point of view consequently collapsed like a house of cards. 'Der Taug' finds her in complete disorder and dire distress without the shadow of a dream of ever securing the first place in the sun. The Empire, which ruled the waves can still boast that the sun never sets over it, because, it is broad-based on the people's will—a principle which is at present guiding half the globe. The British realized long ago that they that controlled the waters shall rule the world. The German guns could blow up the strongest fortifications on land—on water exist no barriers on which they could wreak their wrath—their missiles fall flat on it and are absorbed instantly without doing the slightest damage to aught except to themselves. Out-numbered and out-classed by hostile surface craft, the German navy resorted to the submarine which no doubt did deadly work but its day too has been done—and the world breathes free after four years and four months of unheard of fatalities and new-fangled devilries. The issue of the conflict was sealed by operations conducted on water, though finally settled on land. Germany's defeat became a foregone conclusion when the submarines (on whose success she had staked her all) found themselves cabined, cribbed, confined or captured on all sides. Germany by losing the good will of her sailors has lost her last ray of hope of maintaining her position even in the waters of what she claimed as her own German Ocean. There are so many lessons to be learnt from this historic event besides the one we are emphasizing here—the importance of a nation's power on water. For her power on land, pure water is also a prime necessity, as no army can exist without the continuous supply of it in any military undertaking whatsoever except for a brief period.

Let us now turn to the importance of

water within a nation's territorial boundaries. The war has rivetted our attention on this aspect of the question no less. Nearly all countries have had to think of the conservation of their natural resources. The utilisation of waterways became imperatives because of the congestion of railway traffic. Great projects of this nature have been carried out before, but the most recent instance is that of the New York State large canal, which provides a navigable route from the Great Lakes of Erie and Ontario to the Atlantic Sea board, *via*, lakes and rivers like the Oneida lake and Hudson river. In India the Government is collecting information and devising ways and means unto this end. The Indian Industries Commission has advocated the establishment of a Waterways Trust in Calcutta. They also urge the employment of water power for industrial purposes to a much larger extent than has hitherto been the case. Coal, even where abundant, is getting dear and depleted day by day owing to the great demand for it. Petrol is scarce and oil equally so, wind power is unreliable and discontinuous. To keep the world's work going, power is necessary. Where is it to be found if fuel—whether in the solid or fluid form—is not to be had in future in sufficient quantities, except in water? Water has so far been allowed to run to waste in so many places where power could easily be developed from it, because sites are seldom situated near great industrial centres. Electricity has, however, shown us a way out of this difficulty. Power that has been generated at one place may be used at another scores or even hundreds of miles away, if transmitted electrically. The other methods of transmission of power—wire rope, hydraulic accumulator, compressed air or gas—have failed to keep pace with the progress made by the electrical system. This system has not only made possible the utilisation of existing out-of-the-way water powers but accelerated the development of new water powers or the

re-development in a single large hydro-electric scheme of several small water power plants. The hydro-electric age has arrived. Not only in domestic and private life but in industrial and public undertakings, water bids fair henceforward to displace coal more and more as the years roll by. The realisation of this prime and primeval necessity of life as a vital force of the greatest promise for the progress of civilization has become so wide spread in countries directly affected by or engaged in the war that even the advertisements of up-to-date manufacturing firms dwell on the manifold virtues of water, acclaiming it as the supreme source of power. "In water, life had its beginning. Without water, no living thing can exist. And not only does it slake man's throat, make fertile his fields and provide the great highways of commerce, but it is its one greatest source of power for the future. Even the age of coal would not have done its great work for transportation and industry without water with which to generate steam. And in the greater age of electricity, it is to 'save us from the peril of exhausted coal fields; we have prepared for the day when 'white coal' would increase the capacity of our railway and factories, build cities, enlarge the production of mine, field and forest and enable power and prosperity to keep pace with population." ²

The development of water power may generally be made to serve a doubly useful purpose. The water, after it has provided electrical energy by turning generators, coupled to turbines through which it passes (rotating them in so doing by reason of its pressure, velocity and potential energy), can be utilised to irrigate the lands through which it makes its way to some river or sea. Combined water power and irrigation projects give the greatest promise of success. Water required to turn the turbines need not necessarily come from natural sources, such

as water falls, but can be obtained from artificial reservoirs like those constructed or under construction on the Western Ghats by the Tata Hydro-electric companies.³ In India, many favourable sites exist which have not yet been utilised, for production of water power. Realising that 'the harnessing of water power affords a more reliable source of power' (than the others mentioned above), the Government of India have now appointed a committee to undertake preliminary investigations with a view to starting a systematic survey of water power resources in India for industrial development. It is a part of the Koyna River project not only to construct a water power and electrical plants but to start electro-chemical industries not far from sea-ports within 180 miles from Bombay. Government will use the spent water for irrigation.

So much for the place of prominence now assigned to water in industry. Its value in medicine is equally recognized in Germany, France, England and America, where hydro-pathic institutions have multiplied. The Turkish bath is now a public institution. The healing virtues of water used inwardly and outwardly are within common knowledge and daily experience. The wet sheet pack is a regular part of modern medical practice. For certain ailments e.g., abdominal typhus and hyperpyrexia, cooling baths possess peculiar advantages.⁴ The war has banished wine from the board and reinstated water in its rightful place on the dinner table. Prohibition of intoxicating liquors and drugs

² Westinghouse Electric Company's advertisement in the *Scientific American* for June 29, 1918.

³ Mr. Joyner has been associated with these companies from the time they started their works. He writes:—"We can produce enormous quantities of water power. And not only that but the water giving such power will increase the food supply, ensure the growth of materials for industrial products, provide the fertilizers and the light, reduce the possibilities of famine and allow the populations to be less dependent upon agriculture and its uncertainties and so help the *general ease and contentment of the country*"

⁴ *Encyclopædia-Brittanica*, Eleventh edition.

is the avowed and settled policy of most progressive states of the West, where water used outwardly has already been recognised to possess undoubted value. The spas, to which people afflicted with disease resort, are reputed the world over, several of them being found in Germany and Austria. Mineral springs in Canada and the United States are also patronised, some more than others, e.g., Saratoga springs. It is interesting to learn that the therapeutic value of the water of such waters does not spring so much from their chemical composition. Water made at other places though of identical constitution—even water transported from the spas—lacks the virtue the same or similar water possesses when taken fresh from the spring. This secret seems to lie in their radio-activity. Some wells, like the well-known one at Bath, England, gives a radium emanation of 1730 units and 139 units of radium.⁵ Others not so rich in their radio-active elements are still very famous. Some thermal and mineral springs exist in Kashmir and North India and at certain places in the Deccan, but they have not attracted the attention they deserve or done the good they might be expected to do—which is a pity. On the other hand, orientals of all men are taking to spirituous liquors and pernicious drugs, thus making themselves more prone to the inroads of disease than their poverty alone would do. Let them continue the use of water, which has been shown to contribute to both individual and national wealth. We have just referred to the victories won by water over wine specially in the West since the war started. Germany would not give water her place of honour on the dining table or prohibit wines. The great democracies and republics are definitely on the 'dry' list so called. The future belongs to water.

⁵ *Nature*, March, 7, 1918.

THE DEVELOPMENT OF THE PAPER MANUFACTURE IN INDIA.*

BY MR. RAITT, F.C.S.

Consulting Cellulose Expert to the Government of India, Forest Department.

IN seeking to divert your attention for a short time to this subject some slight apology for its introduction into a series of lectures such as the present is perhaps called for. I think, perhaps, it is true of the average man to say that paper is one of the daily necessities to which he gives scarcely more thought than to the air he breathes. It is so omnipresent, so all-prevading throughout his daily life and activities and withal so cheap—I am, of course, dealing with normal times and conditions—that he never gives a thought to what it means to him in the aggregate or to the nation or the world as a whole, and he may therefore wonder why it should be considered of sufficient importance to be publicly brought to his notice in this form. But we are dealing with a substance which, in the form in which we are most familiar with it, paper, the world uses ten million tons per annum. If we widen our field of view and consider it as cellulose or pulp then we deal with the basic substance of a whole host of other industries of which celluloid, artificial silk, compressed boards or artificial wood, and some forms of explosives are only a few of its many applications and these are increasing in number and importance every day. In spite of its apparent chemical inertness, its curious ductility, malleability and capacity for transformation into substances which have not the remotest resemblance to its original form render it quite futile to prophesy where and in what form it will break out next. Even now the cellulose industries as a whole, including paper, come next to

* Address delivered at the Indian Museum, Calcutta.

cotton manufacture in volume and value among the fibre-using industries. And if value and volume are not enough to interest you then regard for a moment a negative view of the matter. Think of what it would mean to you if it did not possess that attribute which causes you not to think of it—its cheapness! Think of the additional brain fag and worry introduced into your lives if you had to study economy in paper, if you had to borrow newspapers instead of buying them, if you had to consider carefully the cheapest method of replying to a letter, whether you would use the fly-leaf of the chit you were replying to or write it across the communication itself, or get the *duftari* to dig you out a scrap of unused paper from the waste-paper basket, or use the backs of last night's bridge-scoring sheets, or write your reply on a slate and send the peon round with it! I venture to say all this and its cumulative effect would reduce your retiring age by five years if it did not send you in combination with other things, into eternal retirement before even that reduced retiring period was reached. You therefore owe the paper-maker and his industry some consideration for having saved you from that, and one reason for imposing myself on you this afternoon is, that this state of sweet doing nothing, of taking no thought for the morrow, has been and is seriously threatened with disturbance and revolution, for the world's supply of those raw materials now in use has been reduced and continues to reduce in an increasingly rapid ratio, and unless a new source of supply is developed the evils I have hinted at, will ere long overtake you.

THEN AND NOW.

There are still a good many men in the street who will reply 'rags' if asked what paper is made of, but rag has for long been a quite insignificant item in the quantitative sense. The chief source of supply for 40 years past has been wood, the coniferous wood, and preferably the spruce, of Northern Europe and America, and from this

about 75 or 80 per cent of the world's consumption of paper has been produced. When this industry began the conditions for it were nearly ideal and were fondly regarded as inexhaustible. Enormous areas were covered with spruce and fir on rivers and fiords down which the timber could be floated to manufacturing sites on deep sea water from whence ocean steamers could bear away the product at the lowest possible cost. Then, the competitive demand for it as timber, *i.e.*, for constructional purposes, was negligible, there was more than enough for all; then the world's paper demand was only four million tons; then no one took any interest in the conservation of these forests; so profound was the belief that they were inexhaustible, that they were suffered to be swept clean away destroying all hope of natural reproduction, and introducing factors, such as impoverishment and denudation of soil from absence of natural covering, which have converted whole provinces into sun-scorched, frost-bitten, barren wastes where even artificial re-forestation is an almost impossible problem. Now, the large areas within easy transport reach of factories on tide water are gone for ever and areas still open to those that have survived at a distance, which has enormously increased the cost of transport of the raw material. Now, the world's demand for paper has increased to 10,000,000 tons and is growing at the rate of 25 per cent in every ten years, so that in 1928 the demand will be twelve and-a-half million tons, in 1938 nearly sixteen million. Now, the timber demand for constructional purposes has increased so enormously that the pulp-wood limit in size of logs has fallen from 12 inch diameter to 6 inch and even 4 inch in some districts. Now, Governments everywhere are so fully alive to the necessity of forest conservation that restrictions are being imposed on their exploitation. The net result is that in 1913 there was not enough pulp to go round and

that prices had advanced during the previous ten years by 25 per cent that the market could now, assuming normal conditions, absorb an additional million tons, and in 1928 will probably ask for three million tons from a new source of supply. Add to that the permanent increase in manufacturing costs in labour, machinery and freights, which this war has imposed and the time would seem opportune for a large expansion of the industry in new directions and from new sources. I am not going to assert that wood-pulp is in process of rapid extinction. There are still large and untouched reserves of suitable wood in Siberia, Canada, and Alaska, but all at still greater distances from the ultimate consumer and implying a still greater cost to him, and although wood-pulp will still for a long time be an important factor in our paper supply, yet it has fallen into a secondary position to the rapidly increasing contructional demand, having to content itself with that which the saw mill rejects. From the point of view of world economics this is its natural position, for it is economically unsound and wasteful to devote a substance which, when applied to construction, can use from 70 to 80 per cent of the tree, to a manufacture which, in chemically prepared pulp, can only use 33 per cent. It is a fundamental principle in paper manufacturing that the paper-maker can only use that which is of no interest to anyone else. He is emphatically 'a picker up of unconsidered trifles.' As soon as a raw material begins to interest some other industry, it ceases to interest him for these can ill afford to pay more for it than he can and we are now seeing this principle receiving a fresh illustration in the case of pulpwood. Two things are certain: (1) that the days of cheap paper due to wood pulp—the days when the large London newspapers could buy their supplies for a penny per lb.—are gone for ever, and (2) that wood pulp has ceased to be sufficient for the world's supply.

Here let me interject a note on the *raison d'être* of the pulp industry. Time was when paper-makers produced their own pulp from the raw material, and many of them do so yet, but the introduction of wood as a raw material forced a change of system which has made vastly for economy. Wood, as also the raw materials we shall refer to in this country, requires from $2\frac{1}{2}$ to 3 tons to produce a ton of paper. That in a few words explains the revolutionary change in paper-making methods which arrived simultaneously with the introduction of wood. It is obviously a great economy in transport cost to reduce the wood to pulp at or near the place where the wood grows and to transport the pulp instead of the wood to the paper mill, which is best placed in or near the centres of paper consumption and so the separation between pulp-making and paper-making proper occurred and is now a permanent feature of the industry as a whole. Similar conditions obtain in India, and we shall accordingly have pulp mills placed in suitable positions close to the raw material supply and sending their pulp to paper mills whose sites are fixed chiefly with regard to the paper market.

HOW INDIA CAN HELP.

Now we reach the question we are chiefly interested in this afternoon—what can India do to fill the gap which has been created and benefit herself in the process? The answer is a great deal, a very great deal, though not so much perhaps as I sometimes hear assumed. When the threatened shortage of paper supplies was beginning to be agitated some ten years ago I remember an eminent scientist issuing what was intended to be a reassuring statement to the effect that a paper famine was unthinkable because paper could be made from any vegetable substance and the world teemed with. The dictum was seized on by the press and circulated all round the world and no doubt brought much comfort to many an anxious newspaper proprietor. But, like many

other assertions of many other eminent scientists, it was, considered as cold fact, perfectly true and at the same time considered as a practical contribution to a different problem, perfectly misleading and fallacious. Paper can be made from any vegetable substance but money can't. But our eminent scientist's utterance gave rise to a whole crop of wild cat proposals to produce paper from everything, anything and sometimes nothing. I remember one which undertook to produce paper, oil boots and umbrellas from one and the same plant. Nature, however, is not so fantastically generous as that. He whom she would benefit must delve into her secrets slowly, carefully, deeply, hoping all things, proving all things, until finally he can hold fast to that which is good. This has, in essence, been the principle upon which the investigations of the Forest Research Institute at Dehra Dun, to which I am now about to briefly allude, have been carried on. We have thought it more important in the early stages of our proceeding to save people's money than teach them how to make it, for nothing could be more fatal to the inception of a promising industry than a disastrous failure at the start. At the same time, while paying considerable attention to the how not-to-do-it programme, we have met with encouraging success on the positive side. Our eminent scientist was an all-in-whole hog, one hundred per cent, man. We have knocked ninety-five off that, but remain quite pleased with the five which have survived. The truth is that out of the many thousands of species available a large number have to be knocked out because of the cost of isolating their cellulose, a further large number because the cellulose is no good when you have got it, and others because they grow in economically inaccessible situation, not to mention the many species which are too valuable for other purposes to be used for paper. The net result is that so far we have found only two small groups, both belonging to the

gramminaceae which are economically sound as regards the quality of their cellulose and the manufacturing conditions under which they can be handled. These are bamboos, and a few, a very few, Savannah grasses. But, though few in number, in the aggregate they mean something considerable. It is, I think, a very modest estimate to say that from bamboo, taking only that which is available under sound manufacturing conditions, Burma, Bengal, South and West India could produce fifteen million tons per annum and Assam from Savannah grasses, five millions. India could, therefore, produce pulp for the whole world. Consider also the growth conditions under which this is obtainable. To grow a spruce or fir tree to pulp wood size takes from 40 to 63 years, with the result that a factory which may at its start have its supplies at its back-door finds these year by year receding into the distance with constantly increasing transport costs. Bamboos and grasses come to their full maturity as yearly growths and all you have to be careful of is not to reduce the reproductive vigour of the plant by too frequent cropping. With bamboo this may mean a three to five years rotation and with grasses two to three years, according to soil and climate. We must therefore have a sufficient area to exploit to allow of these rest periods, but that only means that for a 10,000 ton per annum output with average figures for yield and rotation a 20,000 acre reserve will keep a factory going in perpetuance, a vastly different condition of affairs from those which govern a wood-pulp installation which lives on its capital from the start.

THE MANUFACTURING SIDE.

On the manufacturing side, the Forest Research Institute has succeeded in solving the difficulties which faced it at the beginning of its efforts. The chief of these were two in number: (1) the nodes or knots and their obstinate resistance to penetration by the digestive liquors employed (this has been

overcome by the simple operation of totally destroying and opening out their structure by crushing) and (2) the resistance to efficient and economical bleaching. The Institute has at last succeeded in evolving, after long and tiresome experiment, a system of digestion which entirely eliminates this trouble, and pulps can now be produced which are equal to the best wood-pulps in both quality and colour. Some samples are here for your inspection. It is satisfactory to know that the Institute is about to embark upon an extensive enlargement of its industrial exploration activities and that these will include a complete modern pulping plant which will enable its laboratory investigations and results to be repeated, expanded, checked, confirmed or corrected on a scale large enough to permit of factory methods being employed. It will thus become demonstrational as well as experimental and its usefulness, already recognized, will be increased.

I have already referred to the fact that to maintain its usefulness paper must be cheap, cheap enough to waste without giving a thought to it. The waste-paper basket is in effect the paper-makers' best friend. When King Edward inspected the huge mustard works at Norwich he remarked that the consumption must be immense to keep such a large establishment going. 'Sir,' replied Mr. Colman, 'it is not what people use that keeps it going but what they waste.' Paper stands in a precisely similar position. We shall probably never again see the extremely low prices of ten years ago, but the permanent rise in its value, though important to paper-makers, is scarcely appreciable to the consumer who buys it by the packet, and, if the industry is to continue to maintain its output, it can never be allowed to rise to a point where its user is forced to be economical in its use. The costs of production are therefore strictly bounded by a point beyond which the manufacturer cannot go. He is also confined by another

limitation to a greater extent than perhaps in any other manufacture, and that is in transport costs. Including his product, pulp, he has to transport in and out of his factory no less than $5\frac{1}{2}$ tons for every ton, of output; if he is obliged to use wood fuel this will be increased to $7\frac{1}{2}$ tons. If his transport costs average Rs. 10 per ton he may find himself liable to no less than Rs. 75 for transport alone on a product which brings him, in, say, Rs. 200, which is an altogether impossible position. This brings me to the second point of my discourse, *viz.*, that next to raw material that of manufacturing facilities in or near the raw material forests. The finest raw material supply in the world may be of no value whatever unless it is both good in quality and suitably low in cost, and in studying this section of the matter the 5 per cent, we have left to our eminent scientist may undergo further serious reduction. It does not necessarily follow that everything the manufacturer requires must be close to his hand. I may be, and frequently is, the case that some extraordinary advantage of position, say, in raw material, may enable him to pay a little more for his fuel, lime, and other subsidiary materials. It becomes a question of balancing up the transport conditions as a whole in order to arrive at whether a site is a good one or not. Perhaps the importance of this phase of the question will be most tellingly illustrated if I quote my own recent experience. During the past seven years I have been asked to revise some sixteen proposals for establishing the industry in this country. Of these I had to reject only three on account of the raw material supply. Of the thirteen left, nine failed and nearly equal to it in importance is to pass the tests applied to subsidiary materials and transport. Only four out of the sixteen have survived investigation. Judging from inquiries I receive, this phase of the matter receives little attention and a suitable supply of raw material seems to be

regarded as in itself a sufficient foundation for the industry. I therefore desire to issue as a serious warning the statement that no profusion or excellence of raw material is of any value whatever unless it is associated with suitable manufacturing facilities. Such localities do exist in India and Burma, but they have to be sought for, and when found their various factors have to be carefully investigated and correlated before they can be pronounced to be satisfactory commercial propositions.

THE BALANCE SHEET.

Let me now detain you for a few minutes with the debit and credit side of the subject. Chemically produced wood-pulp costs on the average pre-war for wood alone and ignoring for the moment all manufacturing costs £ 4-10; say Rs. 65 to Rs. 70 per ton of pulp. Bamboo and Savannah grasses, owing to their abundance and the fact that they reproduce themselves annually and that there is no other serious demand for them will, assuming good manufacturing facilities, cost only Rs. 25 per ton of pulp. You have therefore at the outset some Rs. 40 in favour of India in this one item alone, and a lot can be done with Rs. 40 in a product which may not cost more than Rs. 90 all told on board steamer or river boat. In a plant producing 10,000 tons per annum this means an advantage of 4 lakhs over a European competitor. Inclusive of water freight to paper mills it will, as far as we can see at present, cost round about Rs. 100 to Rs. 110 per ton delivered to consumer. Its value, pre-war, in comparison with imported wood pulp was about Rs. 150. After war it is making large reservations for safety to call this Rs. 200 per ton. The increased cost of freight alone from Europe will account for nearly the whole of this rise. The present consumption of paper and paper goods in India is about 75,000 tons per annum. Of this the local paper mills produce 30,000, so there is a further 45,000 tons waiting for them as soon as they are assured of a new local

supply of pulp. For the last ten years the local paper industry has been stationary at about 30,000 tons per annum, for the reason that it had reached the economic limit of its present sources of raw material, and even to keep up this output they have been importing from Europe 12,000 tons of wood-pulp—an extraordinary anomaly in a country teeming with raw materials and one, that we soon hope to put an end to. I confidently hope to see with the inauguration of a pulp-ing industry a large expansion of the paper output. The market is here already and waiting for it and all that is wanted to enable paper-makers to attack it is a new and local source of material and it is a market which is bound to increase largely in the future. In England the effect of the Education Act of 1870 was to multiply the demand in a few years by ten, and here with the increased attention given by Government and in Native States to education, the expansion will be in a like proportion. In the United Kingdom, the total annual consumption of paper per head of population is about 50 lbs. Here it is at present less than half a pound, so there is plenty of room for the growth that must come, and remembering Gladstone's phrase that 'the consumption of paper is a measure of the people's culture', we may hope that India's culture will, by this standard, advance by leaps and bounds. I think, therefore, that for some years to come India will absorb all the pulp we can produce. When its production expands beyond this, there are Australia, South Africa and the Far East open to it—countries towards which India is much more favourably situated as regards ocean freight than Europe or America from which they at present get most of their supplies. And at the long end of the vista I see no insuperable difficulty in supplying Europe or even America. By that time wood-pulp will have still further advanced in value, while India's resources will still be only in the infantile stage and at a cost which, compared with the then cost of wood, will more

than compensate for the long ocean freight. It is quite within the bounds of possibility that many here present may live to see India supplying the world with this indispensable commodity—a condition of affairs which, politically, will be much more satisfactory than that we have found ourselves in during the last four years when it has come to us with rather shock that for our Empire's paper supplies we are dependent almost entirely on the foreigner.

● A NOTABLE PERFORMANCE.

In conclusion let me put in a word for the manful way in which our local paper makers have dealt with the position created for them by war. You can scarcely imagine more difficult conditions than those they were faced with. Half their supply of raw material (European woodpulp) cut off and chemicals at anything from five to ten times their previous cost and, in some items, not procurable at all, they have literally scraped the gutters and explored the dust-bins in search of material—rubbish which five years ago they would not have thought good enough to throw into their boiler furnaces, and from this they have not only made a usable paper but have kept up their output at its old figure. Knowing something of what all this means I characterise it as a notable and splendid performance. The cynic will say it has paid them very well to do so, but I cannot admit that this in the least detracts from the merit of their effort. When they started to do it they could not know what prices were going to be and it is not they who have made prices: these have been made for them by a market which has been competing eagerly for every pound they could produce. They have done well and deserve well of the community, and owing to them our sundried bureaucrats can still deliver their souls in three lines and have the honour to be your obedient servants on a full sized sheet of foolscap and enclose it in an envelope five sizes too large for it!

EDUCATIONAL MUSEUMS FOR MYSORE HIGH SCHOOLS.

BY B. TIRUMALACHAR, B.A.

EVERY one connected with Education knows the present Educational Museum existing in Bangalore. It may not be perfection itself, but it is there to remind us of what we require. The time is come when the State should take up the question of starting and equipping an Educational Museum in each of its High Schools.

An Educational Museum is indeed a long felt want, and its benefits are many. While widening the interest among students, a well equipped museum is also likely to awaken that interest in the public in affairs outside its usual routine of life, without which interest no advancement in public education can be procured. A well equipped museum, therefore, is of vital interest in an Educational institution of any kind and the starting of a Museum in each of the important schools in the State would, therefore, be very welcome.

A High School Museum should comprise the following sections:—

- (i) Natural Science (including Human Physiology, Zoology, Botany and Geology).
- (ii) Physical Sciences.
- (iii) History and Archæology (including Numismatics and Philately and a sub-section for the History of Literature).
- (iv) Industries and Commerce, including the Technical Arts.
- (v) Art Gallery.

It seems to me that the above sections should all be represented in an Educational Museum, however humble the collection in each section. There should be two divisions in each section, (1) Foreign exhibits, (2)

Local or Indian Exhibits. While the Department should assist in the collections for the 1st Division, students and the public must be called upon to undertake the collection of the II Division. Local gentlemen, if properly approached by a tactful Head Master, would only be too happy to co-operate in such an enterprise. The latent love in the human being for the beautiful and curious takes visible shape in many cases in the well-to-do educated classes and such people can very well be called upon to assist in the enterprise.

To take up the sections one by one, each section may have to start with the following stock. The question of furniture and equipment will be taken up later on.

1. *Natural Sciences*.—This subject forms the most important in any museum, as being the open book of the Creator's magnitude and sublimity. It is in this section, that the child would stand with mouth, eyes and ears wide open and for the first time in its life feel the incomparable magnitude of Life and Creation, and as such too much stress cannot be laid on its importance and the necessity of a judicious selection of specimens for the same.

Human Physiology may comprise of the following exhibits:—The human skeleton, models of the eye, the ear, the throat, and the heart. If possible, models of the whole of the viscera of man may be supplied. Physiological Charts should be suspended from the walls.

2. *Zoology* should be represented in the following sub-divisions:—(a) Charts to represent unicellular and microscopic organisms. (b) A number of sponges. (c) Bottled specimens of Polypes and Medusas. (d) Corals and sea anemonies. (e) *Mollusca* (this will form by far the largest section as the variety of life in this section is very vast) to be represented by a good collection of shells. (f) *Echimodermata* to be represented by starfishes and sea-urchins. (g) Bottled specimens of Prawns and Cray-fishes Dried

Crabs, (including the washerman crab and the hermit crab). (h) Insects (this again forms such a large field, that a collection must be very choice, due care being taken to include the mantis, the leaf and the stick insects and the various devices of nature at deception among insects). (i) *Archnids*, comprising a good selection of spiders and scorpions. (j) Fishes, stuffed and bottled. (k) Reptiles, (a well mounted cobra, bottled and stuffed snakes, skinks, chameleons and other lizards). (l) Birds, eggs and nes in the collection of the last two of which students could be made to compete. (m) *Mammals*, to be represented by a bat, a flying fox, an ant-eater or armadillo, squirrels, a winged squirrel, a duck-bill, a porcupine or hedgehog, a stuffed cat, or leopard and a monkey; the teeth and claws of important animals, a few horns, antlers, and a tiger skin, will form useful adjuncts. Pictorial charts representing rarer animals may also be supplied. (n) *Parasites* to be arranged according to the classes to which they belong. (o) An aquarium with local fishes and a tortoise.

3. *Botany*.—Different kinds of wood tissue, mounted specimens of leaves and small branches and plants. The students would very willingly take part in the mounting processes, if facilities and instruction could be given to them. Particular attention may be paid to this as mounting is a very easy process and a very cheap one. Charts and specimens representing different kinds of roots, branches and specimens. Coloured pictures of as many flowers as possible (classified carefully into Indian English, American and African). The flora of each continent in charts. Insectivorous plants (in models and charts), and parasites. The school garden should form the living adjunct to this sub-section of the museum.

4. *Geology*.—In this sub-section *Minerology* may well be represented by a good local collection and a fairly representative one of foreign minerals, paying particular attention to their natural occurrence and

characteristic formations, in such as zeolites, Agates and chalcedony, garnets, serpentines, tourmalines. Crystal formations should be well represented, the following local crystals being common:—(a) Quartz, (b) Garnets, (c) staurolite and epidote, (d) Oxides in corundum and spinels and magnetites. (e) certain filspars and calcites. A small cabinet of precious minerals and another one of commercial ones may be supplied.

Physical Geography and Dynamical Geology.—This part can be represented only by charts and models. Charts, representing seasons, tides, wave factions, atmospheric phenomena, falling water phenomena, geysers and volcanos, earth pillars, and the canons of Colorado and such like.

Palæontology to be represented by charts representing the past epochs, particularly the epoch when the world was ruled by reptiles, the iquanodon and its allies. It would be interesting for the students to trace in this section the evolution of the horse and the elephant. A picture of the Archæopterix, the connecting line between the bird and the reptile, should not be omitted.

Many of these charts if not readily available could be got prepared by local artists and got printed.

5. *Physical Science section.*—This section forms in other words the laboratory of the school. Of course, it is not possible to transfer the whole of the Laboratory to the Museum Room. But such of the things as are of general interest may be sent over to the museum, such things as a gyroscope, the inclined planes and one or two sets of pulleys, models of pumps, the air pump and the water-pumps, model of the Bramah Press if there is one, one or two turning forks, a syren apparatus, a barometer, a thermometer, an air-bulb thermometer, a microscope, a telescope, a spectroscope, a kaleidoscope, magnets of different shapes, compass ordinary and mariner's, an electro magnet, an electrical bell, frictional electric machines, and some electric toys, and a small magneto

machine like the one in use in the Electrical Department for testing circuits. Of course, many of these will be in requisition in the laboratory, and it would not be inconvenient to transfer them when required to the lecture hall or the laboratory.

6. *History and Archæology.*—(a) History—This may be divided into 3 classes, Indian, English and International. The exhibits will be mostly pictorial, other exhibits comprising such things as the evolution of modern tools from the stone knives and hatchets, arms and weapons of different epochs, images, busts and historical statues. Models of weapons of modern warfare can easily be procured from some of the leading English firms.

Portraits of important personages, political maps of different periods, etc. may also be included.

The portraits relating to English History may include among others the following:—Stone-henge of Druidical times, the Advent of the Danes and Vikings, Roman Invasion, the introduction of Christianity, the battle of Hastings, King John signing the Magna Charta, a joust in the time of Richard or John, Murder of Becket, a scene from Henry VIII, Burning of Protestant priests, the tower of London and Lady Jane Grey, Sir Walter Raleigh and Good Queen Bess, Execution of Charles, Pride's Purge or "Take away that bauble," The Pretender and Flora Macdonald, The great fire and the plague, Costumes of Queen Anne's time, Battle of Trafalgar, Waterloo, Nelson's Square and Column, American War pictures (if possible), Coronation of Queen Victoria and His Majesty King George reviewing his troops.

International History may include the following pictures among others:—

Pictures of the Trojan War, Grecian Olympic Games, The Pass of Thermopelæ, Pictures of the Pharoahs, Grecian and Egyptian Naval crafts, Roman Coliseum, Regulus in the Carthaginian War, Jesus

Crucified, The first Christian martyr in the Coliseum, Cicero's speech in the Senate—"Cataline, how long now will you abuse our patience," The Crusaders in view of the Sacred city, Charlemagne and his Courtiers, Field of the Cloth of Gold, Jean d'Arc, the Spanish Armada, Columbus and Vascodegama, Napoleonic Pictures "1814," The retreat from Moscow, The French Revolution and the Guillotine, The Hague Conference, The international exhibition, opening of the Panama Canal, Coronation at Delhi "1914" or the Rally of the Empire, the burning of Louvain, etc.

Numismatics and Philately require no description as the students will of their own accord take to it willingly. Some journals on these subjects may advantageously be caused to be supplied to schools. A treatise can be got prepared by the Archæological Department describing the Numismatics of Mysore State.

(b) Archæology may include among others, the history of Weapons, Armour, Coinage, Utensils, Inscriptions and Architecture traced in specimens. Due care must be taken in regard to the judicious selection of pictures in the last section, viz., architecture, beginning from the Pyramids and the fanes of Greece right up to St. Paul's Cathedral and Westminster Abbey on one side and to the Tajmahal on the other side. A good model of the last may be obtained and exhibited. Photographs of Sravana Belagola, Halebid and Belur Temples of Somanath and Srirangam can all be easily procured. Photographs of typical buildings in Architecture may be supplied. The Archæological Department may be requested to furnish of Asoka's copies Edict and such other inscriptions. They may be requested to supply duplicates if available of all coins of historic importance.

7. *The Industrial and Commercial Section.*—Models of machinery of all kinds may be procured at comparatively low cost. A suspension bridge, a model steam engine

and an electric motor that can be worked by a small battery, models of an Æroplane and a steamer or a gunboat should be introduced. The Industrial School nearest to each Centre may be called upon to furnish models, castings, etc., prepared in the school. Models of looms and spinning wheels should also be procured.

8. *The Art Gallery*, should be represented by (a) Pictorial Art, (b) Statuary, (c) Musical Instruments and (d) other arts.

(a) Representative collection of paintings of the English and French Academies, the Italian School, the Northern Indian School, and the Ravi Varma School.

(b) *Statuary.*—Porcelain imitations of Grecian Art, vases and busts of Julius Ceasar, etc., can be procured. Mhatre's Studio can furnish at reasonable cost specimens of Indian Art of the latest type. Bronze and Copper Statuettes of South Indian Art may also be represented. This section can very well be made successful by a tactful appeal to the local educated gentlemen. Each school should approach the well-to-do gentlemen who are its own "Old Boys" and request them to take an active interest in the development of the museum.

(c) A representative collection of musical instruments, both Indian and Foreign, can be made by an appeal again to the local gentry. A good leg-harmonium may be supplied to each High School, which while being an exhibit in the museum can be utilised as an item of amusement on occasions in the school at its meetings and bigger public functions.

(d) Other specimens of art presented by local gentlemen may also be exhibited.

ACCOMMODATION AND EQUIPMENT.

To suitably accommodate the above is a question of some importance and as such requires care in the matter of building and furniture. A good hall for locating the museum is necessary. A hall of the dimensions of 40' x 20' should be erected

in close proximity to the High School, but sufficiently far from the class rooms as not to cause interference with class work. The length of the building must run east and west so as to allow as much Northern light as possible to enter the hall. The frontage should possess an elevated portico with His Highness' Arms embossed thereon. The windows should be so arranged as to allow of space to accommodate glass shuttered almiras of dimensions 7' x 6' to run along the walls. A good sized round table of about 8 feet in diameter should adorn the centre with a sufficient number of light students' chairs round it. Four show cases symmetrically disposed would add to the equipment, the Harmonium and the Curator's table occupying corresponding alternate corners. Two aquaria or an aquarium and a vivarium would add to the completeness of the museum. Opposite the entrance, a portrait of His Highness should be suspended and antlers and Bison Horns should be tastefully arranged around it. The almiras are to be of rose wood or black-painted wood, with large glass panes and painted white inside.

Such an equipment would be well worthy of any Educational Museum and would justify the objects of the educational policy of the State. If the equipment is found a little too costly, it would be far more advantageous in the long run to open one museum at each centre year by year than open all the dozen ones the same year fitted up in an imperfect fashion. While not reducing the expenditure to any appreciable extent, such ill-equipped institutions are bound to be miserable failures.

MAINTENANCE AND CARE.

Naturally the next question will be the maintenance and care of the museum. There ought to be a Curator, which goes without saying. But who the Curator ought to be is a question of importance. The Curator ought to be one who knows all

about the contents of the museum. The best man for the place would be an assistant master of the school who has taken up Natural Sciences as his optional group for the B.A. Course. He knows, though not much, at least a little of every subject. He knows, though not much, at least a little of history and something of the Physical Sciences. Natural Science is his optional group, and as for the Arts, he is a Batchelor of Arts. Such a man easily must be trained as a Curator which can be done at a comparatively easily.

The following scale of recurring expenditure may be suggested in connection with maintenance charges:—

	Per annum.
1. Allowance to Curator at Rs 30 ...	Rs. 360
2. One Attender at Rs. 12 ...	Rs. 144
3. One Sweeper and Gardener at Rs. 7 ...	Rs. 84
4. Recurring annual grant ...	Rs. 120
	Rs. 708

There may be people who could call this expenditure a big one, but considering the education such a museum would give to visitors, both students and non-students, the expenditure is nothing. The true view in matters of this kind is that a State can never spend too much for the education of its children.

A report, issued by the Indian Government, of tests by Mr. Musgrave, Alipore, states that he finds that Indian Bundi and Katni cements, as at present manufactured, are equal to the best English brands, also that the same is true of Porbandar cement, except as regards its tensile strength, which is somewhat low. All these cements are sound, reliable, and suitable for every class of work. Imported cements are not infrequently found to have deteriorated during a voyage, and Indian cements offer advantages in this respect also. When the article has to be conveyed long distances by rail from the factory to the consumer, the freight charges add greatly to the cost, and for this reason it is desirable that cement factories should be distributed over the country as widely as possible.

CLOSE PLANTING OF RAMIE FIBRE.

BY H. A. CARTER, A.C.R.A.

AS we have already stated in our columns M. Faure, a French Engineer, of Limoges, Haute Vienne, France, has for some considerable time claimed, and, as we then said, experts consider quite truly, to have achieved, most successful results in the growth of ramie on a field of his rather more than one-third of an acre in size, on the outskirts of Limoges at which town he has a Machinists Works. At the request of the Department of Oversea's Trade Development, 73, Basinghall Street, London, E. C. 2, Mr. G. S. Boddy, Acting British Consul at Limoges has just paid a visit to this field, and he has made an interesting report to the Department upon it. Cultivation had, he states, to be abandoned when the war broke out in 1914; nevertheless, on the occasion of his visit in July last he found the ramie plants still growing well, though lack of cultivation had led to the springing up of weeds amongst the plants in different parts of the field, which have prevented their full growth and development. He cut several stems from various portions of the field, and had the same carefully weighed, and he counted the number of stems growing on numerous patches of land, a square yard in extent, situate in different parts of the field, and from calculations he has made, based upon these tests, he says he has no doubt but that M. Faure speaks the truth when he says that the two crops which he obtains from this field give him a yield of decorticated China Grass which, presuming the field were to be one acre in size, would be equal to a yield annually of two tons of useful saleable ramie fibre, which compares very favourably with the yield got by Indian planters in the growth of ramie to-day. The fibre grown at Limoges is decorticated by a

machine of which M. Faure is the inventor.

M. Faure has his ramie plants set in the rows at just one foot distance apart, the one from the other, and the rows are drawn just one foot distance apart from one another. He attributes the good crops he gets largely to this circumstance.

An English agricultural expert says that, in his opinion, the reason why ramie should always be planted close is because in the case of plants the roots of which are ramblers, and ramie is one of these, when they are planted wide, their outside roots suck up all the nutriment in the soil, and their inner roots go short of this, the plants making a great deal of wood and little fibre but when they are planted close their inner roots are much better fed, and the plants make far more fibre, and less wood. He has found in the growth of tomatoes, the roots of which also ramble, that wide planting leads to a great deal of wood and little fruit, and close planting to much more fruit, and far less wood; further, close planting in the case of ramie promotes the vigorous growth of tall straight stems which are the class of stems that pass most successfully through existing decorticating machines, and the close planting further checks effectually the formation of side branches. Each side branch on a ramie plant, it must be remembered, breaks the continuity of the fibres contained in the parent stems, which reduces the fibres' strength, and lowers its value on the market very greatly; lastly, tall ramie stems yield more useful fibre than short stems, and yet fibre of quite as fine and strong a quality as what is got from the latter. This expert says, and he has had much experience in the growth of this class of plants, that in the case of ramie whenever a soil is found to give successful results in its growth it should be analysed and then when it is sought to grow ramie in other soils in other districts, or countries, the soils selected in these should also be analysed, and those constituents possessed by the successful growing soil

which the new soils are found to lack should be supplied to them by the use of chemical manures and fertilisers.

In an earlier letter written to the Department in December 1917, Mr. G. S. Boddy, the Consul, says growers at Limoges say cultivators must first find the right kind of soil and climate to grow in. A very deep soil which permits of irrigation being resorted to if necessary, is the soil which suits the plants best and the latter, they think, should be raised from cuttings; further, as its leaves call for a great deal of sunshine, the plants should be set where they will be well exposed to the sun. English planters, however, consider propagating from root divisions the best and cheapest method. Which of the two systems is really the most satisfactory is only to be decided by actual experiments, in the writers' opinion, and our planters think the plant thrives best in the shade. Growers need to be patient, the French say, for it is only after a three years trial that it can be ascertained whether the cultivation is a success or not. They should experiment for a start on a small scale so that they can study the points in growing closely, and when they have mastered these and solved them, they can undertake growing on a larger scale, where, if they are careful, it should prove a success. M. Faure says it has been particularly noticed at Limoges that when ramie plants are set a certain wide distance apart in the soil, they make a great deal of wood and little fibre but when they are planted close together in the soil, they make far more fibre and less wood.

Sir Alex Hosie, who has lived in China and studied the growth of ramie there, says there is no doubt but that the Chinese know best how to grow ramie, and he says they always set the plants at eighteen inches distance apart from each other in the rows, and draw the rows eighteen inches distance apart from one another.

Mr. Edward Vicars, British Consul-General at Lyons, France, says a considerable amount of ramie is used annually in Lyons. One firm of merchants, he adds, Messrs. Varenne et Rykebus of that city, sell some 1,500 tons a year, and they would be glad to receive offers of ramie. The writer thinks, however, they would like to have it offered to them in the form of China Grass.

Three Lyons firms use ramie in their works; the Consul seems to mean degum it; they are:—

Messrs. Duparquet Freres et Cie, 92, Cours Tolstoi, Lyons; Societe Industrielle pour la Filature de la Ramie, Lyons; Societe Lyonnaise de Cardage et Filature 4, Petite Rue de la Rize, and one firm at Bellegarde, which is in the Lyons district:—

Societe de Filature et Cardage de Bellegarde, then, there is a firm who degum, and manufacture the fibre largely, he adds, in Consular district of Marseilles, viz., Messrs. P. A. Favier and Cie, of Entraigues, (Vancluse). Limoges is in the British Consular District of Bordeaux.

In his letters on the matter written from the Consulate, Lyons, on the 7th and 21st November 1917, respectively, which gave the above information, Mr. Vicars states that ramie is used in France to blend with silk for upholstery materials, lace, (notably the Le Puy Lace Works), for incandescent gas mantle bases, fine linen, and lingerie, sewing thread, costly fine paper, women's hats, and could be used for lint but is expensive. The writer has been told by other persons that it is used for lint to some extent. Evidently the French find ramie materials not too expensive to buy, and durable, or they would not have used the fibre as they have done for a very fair number of years, now, for these purposes. It has been reported officially that many use ramie in place of linen in France as they find it stands wear and washing better than

the latter, and is often rather the cheapest of the two to purchase.

It is a mistake to make the irrigating trenches on ramie lands wider than can possibly be needed, and if this is done with the idea of saving time in doing the work of irrigating, and so saving wages, it may be said that it is far more to the planter's interests to take longer in carrying out the last named operation, pay rather more in wages and have his irrigating trenches narrower in width. The saving which he thus effects in good productive land will far more than compensate him for the slightly larger wages which he will have to pay; indeed, this saving of land may mean to him all the difference between securing the maximum yield of useful saleable fibre from his fields and his getting unsatisfactory and unprofitable fibre crop. Further, cross irrigation of the fields, that is, the cutting of irrigating trenches across the rows, and between the plants, in addition to cutting irrigating trenches alongside the rows of plants, should never be done unless it is absolutely certain from the constant recurrence of drought, or lack of proper rainfall in the district in which the fields are situated that this is necessary. Cross irrigation of the fields, except in cases in which it is absolutely indispensable, is only needless waste of productive land just the same as cutting the irrigating trenches too broad in width. In 1910, the ramie stems on M. Faure's field grew to the height of eight to nine feet, he states, and their fibre yield was large in proportion. This further proves the advantages of close over-wide planting. His field is manured with horse dung just once every three years. Stale urine of sheep and animals, however, is said to be one of the best manures for ramie. Nine square metres of land at Limoges yield 1,000 to 1,600 ramie stems and it is said in a circular describing the field and printed at Limoges that as many as 160 stems have been counted on one plant. This represents

400,000 stems per acre, per crop, and two crops are got annually at Limoges. Ramie fields should always be well sheltered from cold and prevailing winds. During the very cold winter months at Limoges the temperature is 3 to 6 degrees lower than that of Paris, and during the hot summer months it is just so much above the Paris average. The annual rainfall in the district is about 34 inches. The field is about 500 feet above the level of the sea, and its subsoil is silicious. These particulars would seem to indicate very clearly what constitutes the right climate in which to grow the fibre, and it is generally admitted that the soil which suits the growth of ramie best is a good deep sandy loam, not too sandy a soil, however. The subsoil should be porous so as to carry off the excess of the rainfalls. For forty days of heat in the shade at Paris there are about sixty days at Limoges. There is no doubt but that we have a great deal to learn as to the cultivation of this valuable fibre plant from the European continental nations, and much valuable information on the subject can be got from the pages of the journal "*La Rivista Agraria*," the official Journal of the International Bureau of Agriculture which is published in English, French, German, Spanish, and Italian, and may be obtained through the medium of any of the large publishers in the principal capital cities of Europe.

The Department of Overseas Trade Development say their experts state that the ramie fibre is about the same length as some of the long wools, and nearly as long as flax, that it is considerably longer than the fibre of cotton, and cannot therefore be used with cotton machinery. It has been blended with wool in the preparation of worsted yarn, and when the ordinary dyes for wool were used to dye both fibres, the ramie refused to take most of the dyes used for the wool. It was found, however, that a certain fashionable effect—fibres showing

white on a coloured background--could be obtained in suitings, and dress-goods by substituting ramie for "Kempy" wool, the supply of which is limited. Nowhere it must be pointed, specially, out that when ramie, which is a vegetable fibre, is blended with any of the wools or silk, which are animal products, special dyes must be employed. The ordinary dyes which dye wools, and silk when manufactured alone, and those which will dye ramie when manufactured alone, will not dye these fibres when they are blended together in a successful manner, as the ramie is vegetable, and the wools and silk are animal products. These special dyes are, however, known to all experienced dyers, and with them the very best results can be got, the colours obtained being rich, deep, level and lustrous. The writer has seen splendid dyeings of piecegoods manufactured from ramie and wool, and ramie and silk, done in England. If any firms desirous of dyeing these fibres blended together find difficulty in doing this successfully, they should communicate with some experts such, for instance, as Professor Alfred Barker, M.Sc., of the University, Leeds, Yorkshire, or the Principal of the Dyeing School at the Manchester Municipal Schools of Technology, or insert an enquiry in the columns of some journal like "The Textile Recorder," Manchester, seeking to be placed in communication with some dyer who can instruct them how to get the best results in this class of dyeing. If neither of the gentlemen named above can supply full information on the matter, they will be able to furnish the names of experts on the subject who can.

A very valuable paper on the "Culture and Extraction of Ramie in Western China" by Sir A. Hosie is printed in Volume IX, Part I of the "Journal of the Agricultural Society of India." The writer of this article says there is no doubt but that the Chinese know best how ramie should be grown, and he states they always set the plants at eighteen

inches distance apart from one another in the rows, or furrows eighteen inches apart in distance from each other, so clearly they consider close planting the best method to follow.

The Chinese in Ssùch'uan, in Western China, produce China Grass as follows:—At the harvest the workman siezes the ramie stems about nine inches above the ground between the thumb and the fingers of the right hand, snaps it over to the right causing a fracture, pushes down and sideways, the upper part of the stem on the fracture to complete the division of the wood, inserts the forefinger of the right hand in the fracture which is now compound and draws it up between the peel on the left and the wood, and adhering peel on the right removing on its way branchlets, leaves and tips. He then draws down the peel on the left with his left hand to the root where it is easily detached. The peel and wood on the right is removed in the same way and the latter being but loosely attached can be easily separated from the peel. The workman then separates the useful fibre from the cuticle of the stone as follows:—A piece of bamboo $\frac{1}{2}$ in. thick, $2\frac{3}{8}$ in. long, and $\frac{5}{8}$ in. broad is grooved in the middle of the two half sides, and an arched band of copper or iron $\frac{3}{8}$ in. wide at the top of the crop, and widening to $1\frac{1}{8}$ in. at the base is hammered into the grooves. This forms a ring which is put on the thumb of the right hand, the metal on the top, and the flat piece of bamboo on the underside of the thumb. The other instrument used is exactly like an iron shoe horn, and is 7 in. long, 2 in. wide across the broad concave end, contracting to $\frac{3}{4}$ in. at the narrow end with a very short thin tube through which a string may be passed when not in use, for the purpose of suspension. The edges are blunt. The right hand also grasps the other instrument concave side uppermost by the thin end leaving the thumb free. The flat bamboo can now be placed on the inner edge of the shoe horn,

and the ribbons of ramie peel are passed between them, outer layer uppermost, and touching the piece of bamboo. At the harvest the peel is made into bundles and placed in a tub of cold water to steep for as short a time as possible, and never for more than six hours. When the fibre is to be extracted a bundle of peel is removed from the tub, untied, and hung, the outer layer under, over any piece of wood raised above the ground to the level of the workman's breast. Taking a firm hold of the ribbons, one at a time, by the butt end with his left hand the peeler siezes it about six inches from the butt, and as just stated, between the thumb ring, bamboo, and the edge of the shoe horn, and scrapes it rapidly from butt to tip. The outer layer of skin or cuticle, is at once removed, and the useful fibre remains. It is rarely necessary to scrape the bark covered ribbons more than twice, the first scrape is often sufficient. When a dozen ribbons have been operated upon the workman scrapes off the six inches remaining at the butt end, scraping in this case in the opposite direction. The fibre is then hung up over rails until a sufficient quantity has accumulated to be spread on bamboos erected for the purpose in the sun, or where the wind may have full play, and if the sun is shining brightly the fibre will be dry and bleached white in about six hours. The method yields six pounds more cleaned fibre per man, per day, than the method generally pursued in China in which the workman simply scrapes the outside cuticle off the plant's stem with a small sharp knife, and then splitting the stem from top to bottom peels off the best. The fibre is then ready to degum or ret. Sir Alex Hosie, late Commercial Attaché at Peking has seen this method of decortication practised in Western China, and he says some expert cleaners can even clean rather more than eight pounds of fibre per man, per day. While the cost of the process is rather high it is not prohibitive and it is the best method of doing the work which exists until an ideal machine for the purpose comes on the market.

FUEL AND FUEL SUBSTITUTES.

BY THE EDITOR.

THE fuel question in Bangalore has been for sometime a burning question. Many reasons have been assigned why fuel is scarce in the city. A great many people think that an increase in the number of industries in the land is mainly answerable for it. Others seem equally certain that the dearth is mainly due to the War. Some others, again, have given out that it is due to the inadequacy of fuel plantations in the State. These last argue that the old plantations have been exploited fully and that re-plantation has not kept pace with the felling operations. They urge therefore that steps should be taken without further delay to commence re-planting wood. They would ask the Government to order the Forest Department to attend to this re-planting work and encourage private people to bring into existence their own plantations. A few have suggested the remedy that immediate steps should be taken by the Forest Department to bring up supplies of firewood from the forests in the interior and make the same available in the city at a reasonable price. The question of affording increased facilities to private exploiters of forests has also been mooted. This, though difficult, is likely to increase the existing supplies. But the effects of indiscriminate felling of trees is far too serious, from a forest point of view, to allow of this being allowed without adequate safeguards to the forests themselves which may have to be opened up for this purpose. Departmental supply is being tried but the cost of fuel is still great. The use of electricity for cooking and other purposes, and the use of coal have been suggested to obviate the present tension. Transportation charges, it is said, may be saved by the conversion of fuel

into charcoal in the forests before transportation is attempted. Though some people in Bangalore have commenced to use charcoal, even this remedy is not free from difficulty. The question of augmenting the fuel supply, in fact, bristles with difficulties. For a proper solution, much thought and care seem to be absolutely called for.

The question of fuel supply is of more than local interest. The same difficulty is felt outside the State in India and outside of India, in England even. In England they have a Fuel Research Board investigating the whole matter. This Board was not long ago appointed by Parliament and is now proceeding satisfactorily with its work. The immediate problem it is attempting to solve is whether an economical and efficient apparatus can be devised for the carbonization of coal at low temperatures, and whether, by the use of such an apparatus for the carbonization of properly selected coals, products will be obtained of a collective value greater than that of the original coal, plus the cost of carbonization and handling. Among the points which the Board is attempting to elucidate are:—(1) Can electric power be obtained more cheaply if the coal used for steam raising is first subjected to processes of carbonization and gasification? and (2) Can the thirty-five or forty million tons of coal which are now used every year for domestic purposes (in England) be wholly or partially replaced by smokeless fuel, solid or gaseous, prepared by the carbonization of this coal? Some such Board as the one dealing with the fuel problem in England is necessary here to carefully go into this question. A sound decision, if arrived at, would be a great help, both from the domestic and the economic points of view. Cheap fuel means cheaper living and comfort in the domestic circle; while in the industrial sphere it means a great reduction in the cost of producing an article, which again means a greater opportunity for people to buy and use it. The

importance, therefore, of this question cannot be denied. It is to be hoped that the discussions now going on will result in the formation of a Board of the kind we have referred to above, so that the whole subject may be threshed out in all its bearing and a sound solution arrived at.

A few words on fuel substitutes may be added here. In India cowdung cakes are used as fuel. These should be used more properly as manure. This practice has been condemned by so high an authority as Mr. J. Mackenna, Agricultural Adviser to the Government of India. The growing infertility of the soil in this country is largely due to this diversion of manure from the field to the domestic hearth. The use of rice husk and leaves of trees is not unknown to our people. In Spain rice husk has been used for years as fuel for boilers in rice mills. But its use has been open to the objection that the burning process does not consume the whole of the husk. The experiment has been made, however, of mixing the husk with tar and then submitting the mixture to hydraulic pressure, and this appears to have given satisfactory results. The process should be of interest to Bangalore and Mysore, where the fuel shortage is pronounced, and to other rice producing tracts in India and Burma. In the Near East, especially in Roumania, Greece (in Thessaly), Southern Russia, Northern Syria and other parts, the method of disposing of the straw when threshing is taking place is, as a rule, to burn it as fuel in the portable engines which drive the threshing machine on the field, or to cut and bruise it for fodder. In India straw is used mainly as fodder though it is much wasted on this form. This waste is inexcusable, now that the value of straw is coming to be more and more realized. A consulting chemist to a Scottish Agricultural Society asserts that farmers themselves can make straw of greater feeding value by treating it with a solution of caustic soda and heating it under

pressure for about sixty hours. Straw can also be used for making various grades of paper, straw boards and the production of nitrogen for fertilising purposes. Another profitable use of the straw has been found in Canada, where the ordinary method of disposing of it is to burn it—as in India—and at night during the threshing season all the cornfields of Canada are lit up with these enormous bonfires. In Western Canada alone, where the annual average yield of straw is 20,000,000 tons, it has been proved that 10,000 cubic feet of good inflammable gas can be obtained from a ton of straw distilled in closed retorts. The heating value of straw is 400 British thermal units per cubic foot, so Western Canada's annual straw yield might be converted into twenty-two billion horse-power hours, or seven times the former obtained from the Niagara Falls. Perhaps a similar calculation would show the amount of wastage involved in the present disposal of straw in India. In Mysore, probably we are wasting as much of it as in Western Canada. Think what may be obtained by the utilization of this wasted quantity for the production of gas and think of the power that may be obtained from it and the use to which it may be put for increasing not only the area under cultivation, but also by the establishment of other industries. Here certainly is something for all of us to think about in connection with the fuel question.

The Trades Commissioner for the Government of South Africa in 1912 gives the following list of soya bean products:—Vegetable (like marrowfat-peas), ups, meat substitute, chocolate substitute, macaroni preparation, flour, artificial milk cheese, coffee substitute, artificial horn, biscuits and food for diabetes patients, sauce, meal for cattle, oil, oilcake, fertiliser, bean-cake.

ECONOMICS IN THE WEST.

War and Production.

London, August 20, 1918.—Everyday evidence of the remarkable influence the war has had on the science of production in this country accumulates. First in order of importance of the new facts disclosed comes the programme of the exhibition to be held next month in connection with the British Science Guild. The object of the exhibition, it may be said, is "to give the public confidence in the capacity of British science combined with British industrial enterprise, to provide for all present demands and future needs." Aims as ambitious as these will require a great deal of energy and skill in their realisation, but that we are already on a fair road to success may be surmised from what we are told of the results already achieved. In the domain of optics, for example, notable progress has been made. Originally this was quite a British preserve: an English clergyman named Harcourt was the first who successfully produced optical glass of particular properties by the addition of small quantities of different substances to the meltings. But in this as in other cases where the Briton had sowed the foreigner reaped. German professors pursuing the Revd. Mr. Harcourt's discoveries were able to establish factories for the manufacture of optical glass on commercial lines. Subsidised by the State these establishments soon became centres of world-wide importance with the result that the time ultimately came when almost every nation had to resort to them for their optical material. To such a length was the monopoly earned that on the outbreak of war we were actually dependent upon Germany for the gun sighting telescopes, field glasses, range finders and other service instruments which were employed by our naval and military forces. All this happily is now changed. Thanks

to the researches of an experienced band of scientists under the direction of Sir Herbert Jackson of the Institute of Chemistry, we have quite recovered this lost trade and are now in a position to supply not only our own needs but those of our Allies and friends.

STEEL MANUFACTURE.

In the case of steel manufacture a still more satisfactory change has been effected by carefully applied scientific methods. Here as elsewhere we had sacrificed our chances by pure apathy and lack of commercial perceptiveness. To two Englishmen—Sidney Thomas and Percy Gilchrist—is due the invention of the basic-Bessemer process which has revolutionised steel manufacture. Before that discovery was made forty years ago phosphoric iron ores had been considered of small account but the new process by making them available gave an immense additional range to the industry. Germany was quick to see the importance of the discovery and made free use of it with the result that she built up an immense steel manufacturing industry which has enabled her to produce all the guns and munitions she has required in this most devastating war of all times. Supplementing her resources in steel were a wide range of metals, some of a rare character, which with deadly cunning she managed almost to monopolise in the years immediately preceding the war. Tungsten is a case in point. The raw material of this metal is found mainly within the British Empire, but Germany had by our supineness been allowed to get control of it and on the outbreak of hostilities we were terribly deficient in what should have been for us a domestic material. Here, again, a revolution has been effected. Sheffield manufacturers put their heads together and quickly formed a company to supply their need. Scientific advisers worked out a method of working and in the end tungsten won its proper place in the British metal industry.

MANUFACTURE OF POTASH.

Potash is another all important commercial commodity which has afforded a field for the genius of our scientists. In days of peace Germany had a practical world monopoly of this product, thanks to her possession of the potash mines in Stassfurt and Alsace which are of exceptional value because of the solubility of their deposits in water and their consequent amenability to chemical treatment. Though we have many sources of supply of this material, we have no rich and easily worked deposits and it was easy for the Germans before the war to crush out all opposition to their supplies. But war exigencies soon taught us that we were by no means so dependent upon the Germans for potash as they fondly imagined. Investigation proved that in the blast furnaces there is generated a quantity of potash which by a simple process may be made readily available for commercial purposes. Latterly, a systematised organization has been made of these resources and at the present time a Government supported Company—The British Potash Co., Limited—is producing the invaluable material in large quantities. Concerning the method of production I may state some interesting particulars which were recently given in the *Birmingham Post*. It is estimated that for each 1,000 tons of pig iron fed into the blast furnaces with the ore and coke sufficient raw material is furnished to produce from 15 to 30 tons of potash equal to 200,000 tons a year. Of this potential wealth 150,000 tons passes through the furnaces and away in the slags in insoluble form, and 50,000 tons is volatilised and carried from the furnaces in the gas. Of this last quantity about one-fifth is recovered from the heavy dust and from the stones and boiler flues after the combustion of the gas. The remainder escapes up the chimneys. The Company concerned in the new venture had to solve the problem of volatilising into the gas the potash charged with the ores

into the furnace. As the result of experiments it was found that by adding to the charge an alkaline chloride, common salt being the most readily available, from 70 per cent to 80 per cent of the potash charged into the furnace could be recovered, as against the almost negligible 5 per cent previously obtained. This cardinal fact established it was possible to proceed with the refinement. A new factory was established at Oldbury and after rather more than three months' working, the most satisfactory results are able to be recorded in the production of muriate of potash for agricultural purposes. The potash thus manufactured is of very high quality containing only about 5 per cent of impurities as against 80 per cent of the German fertiliser. The intention is if possible to have potash producing factories in association with blast furnaces in all the iron districts. By this means an abundant supply is practically assured sufficient not only for all our needs but allowing a margin for export. Not only is this the case but investigation has shown that potash may be manufactured economically from the liquors produced in the washing of wool and from other sources. Thus is dissipated the German dream that by their monopoly of potash they may be able to hold us to ransom in the period of economic struggle after the war.

ELECTRICITY AND AGRICULTURE.

Potash and Agriculture are inseparable and in the near future so also will be electricity and agriculture. During the past few years experiments have been made in this country on the effect of electricity in promoting growing crops. Commenced in a small way with garden products the trials were recently extended to the farm and this summer 2,000 acres of corn grown from electrified seed have been produced in Dorset. The crops have now been reaped and we shall soon know how they compare with the ordinary cultivated wheat. But as a promise of what is in store we have an

account of a visit paid to the experimental farm recently by a number of foreign experts for whose benefit a square yard of electrified wheat was cut and thrashed and the result compared with the thrashing of a square yard of wheat grown in the usual way. The unelectrified sheaf of wheat produced $4\frac{1}{4}$ lb. and the electrified sheaf $7\frac{1}{4}$ lb. If the whole acreage of electrified corn produces as well as the sample, a really remarkable result will have been secured. As to the experiment Dr. Mercier of Pukstone, Dorset, who is interested in the matter, says:—

"It was found that in every case the electrified seed had thrown up more numerous stalks. In every case the straw of the electrified corn was longer by some inches than the straw of the other, and the ears longer, plumper, and appeared to contain more seeds. In some fields, where the untreated corn had been laid by recent thunder showers, the whole of the electrified corn was standing upright.

"Experienced agriculturists estimated the increase of yield of the electrified crops at from two to three sacks per acre.

"In 1915 some two million tons of wheat were produced in the United Kingdom. If the electrifying process should be universally adopted the quantity produced would probably be increased by half a million tons."

I need not enlarge upon the immense importance of both the potash and the electrical experiments for India. If the immense advantages outlined above are verified by experience India in common with the home land will have at her disposal the means of adding to a vast extent to the productiveness of her soil. Her valuable steel industry will provide economically the one and her potentially important water power will supply not less cheaply the other.

WATER POWER IN THE BRITISH EMPIRE.

Referring to water power I may draw attention to the report just issued of the Water Power Committee of the Conjoint

Board of Scientific Inventions. This body was appointed to report on what is at present being done to ascertain the amount and distribution of water power in the British Empire. Its conclusions as set forth in the report, the first it has issued, is one of a highly interesting character. According to its calculations the power at present being used throughout the world is 120 million horse power. Of this amount 75 million horse power is used for factories and of the 75 million the *United Kingdom* claims 13 millions, continental Europe 24 millions, the United States 29 millions, the British Dominions and Dependencies 6 millions and Asia and South America 3 millions. Between 15 and 16 millions of the world's industrial horse power is at present developed from hydraulic resources, and here the United Kingdom is the most backward of all the countries listed, with the exception of Russia, its 8.3 per cent comparing very unfavourably with the 43.4 per cent of Germany. The Committee estimate that the potential water power of the Empire amounts to at least 50 to 70 million horse power and they believe that much of this is capable of immediate economic development. They suggest that the development of such enormous possibilities should not be left to chance, but should be carried out under the guidance of some competent authority. They further propose that the Government should take steps to form an Imperial Board of Commission to include representatives of all the Dominions and Dependencies to investigate the matter and advise the State as to developments which it might assist or initiate. It is unnecessary to point out the direct interest that India has in this question. Probably in no part of the British Empire, excepting perhaps Canada, are the potential water resources more extensive and promising.

AERIAL NAVIGATION.

The progressive development of aerial navigation under the stress of war is a subject upon which I would say a good deal

did not my patriotic instincts forbid. I may state, however, that within the past few months innovations have been made and improvements registered which will simply revolutionise the war in the air which has already bulked so largely in the hostilities, especially on the western front. Before very long you will hear of some of these changes in a form not to be misunderstood. Meanwhile, I may call attention to a recent speech by Mr. Handly Page the inventor of the large multiple engined aeroplane which has done such signal service on our side in the war. Mr. Page stated that as soon as the war closed it would be possible to open an air service between London and Marseilles with a single stop at Paris for an overhaul and for taking in of a fresh supply of petrol. Before the war the actual transit of mails to Constantinople occupied 72 hours. By air the journey would be made in 20 hours. Rome would be reached in 12½ hours instead of 42 hours, Marseilles in 8 hours instead of 23 hours. He was convinced that an 800 mile service could be run both for mails and passengers at a profit at a rate little in excess of that now in force. Mails would be carried for 800 miles at 1d per ounce and at the cost of ordinary travelling every part of the globe would become available to the traveller by aeroplane. America would become within reach in a day and half and the time would come when the Englishman in New York would see his London paper the morning after publication. Mr. Page said nothing about India, but obviously aerial navigation will have a far reaching influence on your country. London will be brought within three days reach of Bombay and it would be possible for a merchant at Madras to get to Singapore in a little over a day. Truly we live in an age of marvels whether we have regard to the moral influences that are sweeping over the world or the material achievements of its peoples.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

Grain-Dust Explosions.

Washington, D.C., U.S.A., September 11, 1918.—The subject of dust explosions has attained great prominence in recent years, especially in connection with explosions of coal dust in mines and grain-dust in flour and feed mills, grain elevators, thrashing machines, etc. Exhaustive investigations under both of these headings have been carried on unceasingly for some time past. The United States Department of Agriculture has just published a bulletin on "Grain-Dust Explosions," giving in detail the results of many experiments at one of the experiment attrition mills under the auspices of the department, and also reviewing experiments elsewhere.

In this connection it may be stated that the Department of Agriculture, especially through the Bureau of Chemistry, is conducting a special war-emergency campaign for the prevention of dust explosions and fires. Representatives of the department are instructing and aiding the millers and grain dealers of the country in the installation of protective devices and the adoption of safety measures. The results of experiments carried on up to this time indicate that (1) every effort should be made to collect and remove the dust from a grinding mill and the surrounding atmosphere; (2) in some cases it is advisable to use inert gases to dilute the oxygen content of the air; (3) all possible sources of heat should be eliminated when there is any danger of having a dust-laden atmosphere; (4) precautions should be taken to eliminate sparks due to static electricity; (5) more use should be made of sheet iron, or other non-combustible material, in milling plants, on account of the great danger from smoldering lumps of grain; (6) revolving dampers appear to be of some

value as preventing the propagation of explosions; (7) an automatic relief valve is also of some value as a preventive measure.

SIMPLE SUGAR EXTRACTION FROM BEETS.

Some recent experiments in various parts of the United States have shown that the extraction of intensely sweet syrup from sugar beets, suitable for any kind of household use, is quite easy. The plan can be carried out on a very small scale, and, when generally known, is sure to be widely adopted. Sugar beets as a garden crop are more largely grown than formerly and there is an everincreasing quantity of roots.

The best roots should be lifted in the usual way, care being taken that they are not injured. It is most needful to avoid breaking the skin. The roots should be treated in small quantities as the sweet stuff is required. This is for the reason that the syrup will not keep in good condition for more than a month. The method is to wash the roots well in water so as to get all the dirt away. Take care again not to break the skin in any part, or much of the sweetness will be lost in the next stage. Place the roots in a pan and boil them in water until the skin can be easily peeled away. Then slice the roots thinly and put the pieces into the pan again. Just cover them with water. Bring to the boil once, and allow the whole to simmer slowly for about ten hours. This treatment may be spread over two days if it is more convenient. At the end of this simmering take the pulp and put it into a muslin bag. Then hold over a bowl and with the hands squeeze out all the juice you can. This juice is placed in a pan and boiled until it becomes thick and syrupy. The syrup will be very sweet, and of great value for ordinary household purposes.

As has been stated this syrup will not keep for an indefinite period, but it is easy to make it as it is required for use. The beets can be stored away in a dry, frost-free place and taken out as needed.

AN IMPROVEMENT IN STABILIZED SCALES.

The stabilized weighing scale is so called because, while having its platform above the weighing beam, it comprises a mechanism which makes it a matter of indifference whether or not the load be centrally applied. Without such an attachment a badly centered load exerts a rotating movement on the pan and makes it take a position not exactly parallel with its normal one. The stabilizer constrains the pan to motion in parallel plans and so eliminates this tendency.

In the ordinary forms familiar everywhere in the postal and package scales of moderate capacity the stabilizer element is a simple flat bar provided at each end with a hole through which passes a pin connecting the bar, at one end with a fixed part of the scale, and at the other with the vertical stem supporting the platform. In order that the weight registered be independent of the position of the load upon the platform the length of this link, between the centers of the pin-holes, must be equal to the distance between the two knife-edges which, respectively, carry the load and provide the fulcrum.

But when this stabilizing mechanism comes into play there is set up a friction at its pivot points. This friction is notably in excess of that at the knife-edge bearings and it is decidedly variable. Accordingly it limits the sensitiveness of instrument and seriously reduces its accuracy. So the United States Bureau of Standards has set itself the task of evolving a new type of stabilizing member which shall be free from this objection, and it appears to have succeeded.

It is known that the root of the whole evil has arisen from the necessity of having the stabilizing element rigid and inflexible. If the load can be so disposed that its rotating movement would always *pull* on the link instead of sometimes pulling and sometimes

pushing this rigidity could be dispensed with. In the ordinary type of weighing pan, if the load is off center in one direction it will pull on the stabilizing link, if off center in the opposite sense it will push. So the remedy has been found in an offset stem for the weighing pan, carrying the whole configuration of that pan over in front of its supporting knife-edge, between that knife-edge and the fulcrum point. Then no matter where the load lies in the pan its rotating influence is in the same direction. It is now possible to introduce a flexible elastic tape of metal or some other material in place of the rigid stabilizing bar, and it is obvious that this tape can be so joined at its ends, by means of screw clamps, that what under ordinary circumstances would give rise to friction is manifest only in slight bending of the tape where it passes into the clamp. Thus we have a scale which in time will probably be adopted all over the world, and which will weigh large loads with the greatest accuracy.

PROCESS FOR ARTIFICIAL DIAMONDS.

Up to the present time the only proved source of artificial diamonds has been iron or steel intensely heated and then cooled rapidly. Diamonds appear to be formed within the metal after it has set, probably at a temperature of about 690° C. In no other way than this has it been possible to have realized the combination of high temperature and high pressure under which nature appears to have converted carbon into diamonds.

A well known American chemist, who is also a noted lecturer, has suggested a variation upon this procedure. After exhaustive experiments he finds that if a large mass of iron, alloyed with other elements, were submitted to suitable heat treatment, and after setting but while still at a temperature leaving it permeable to gas, were subjected to carbon monoxide at a pressure of about a thousand atmospheres for a considerable time segregations will take place

slowly within the mass and diamonds in paying size and quantity will be commercially produced.

GLAZING WITHOUT METAL.

In the already known art glazing processes the small individual panes of glass are bordered or framed with lead, and then all of them are joined together to form the colored glass window or other decoration. Since the advent of the war, however, the use of metals of all kinds has been more and more restricted so that it has been necessary to find some suitable substitute for this purpose.

According to a new process just devised here the single pieces of glass are arranged in the manner desired upon a fireproof backing and are then joined all together by heating in the kiln with the aid of a good glass flux. As soon as this first fusion has been effected the entire piece of work, together with the backing, is withdrawn from the kiln, finely powdered glass flux is filled into all crevices and joints and then it is melted by the assistance of a blow pipe. The piece of work is now ready for mounting in position, and absolutely no leading or metal bordering of any kind is required. The artistic effect is enhanced by the method of mounting and the picture is not so much "broken up" as by the pieces of metal.

ARMOR-PLATED SEED FERTILIZED BY ELECTRICITY.

In the latitude of the city of Chicago, in the American middle west, it is estimated that the precipitation of nitrogen to the earth in the form of nitric acid by the natural electric disturbances in the atmosphere amounted to ten to eleven pounds of nitrogen per acre per year. In the tropics, where thunder-storms are more frequent and static conditions augmented, a larger amount is precipitated and vegetation is therefore, as we know, more abundant. Accordingly, we may expect that if we discharge electricity through the soil and through the air and

moisture in the soil, we not only will stimulate the bacteria of life to greater activity known to occur after natural electrical discharges, but will give them their principal plant food by producing nitric acid and nitrogen.

In co-operation with the engineering department of a large electric company in Chicago there has been in the past year successfully tested a newly-patented process embodying this principle. High-frequency current is literally driven in a spray through the surface of the soil from distributing electrodes embedded in the earth (about six inches deep), arranged parallel to each other on two opposite sides of the field along the fence lines, out of the way of cultivation. The seeds, before planting, are coated with a finely-divided, non-deteriorating metal, with the object of creating lines of low resistance and a condition analogous to the coherer of a wireless set. Tests were repeatedly made on a field containing eleven acres of corn and a few rows of sugar beets in central Illinois. The increase in the corn production is estimated at 30 to 40 per cent, with an increase in the value of the crop estimated at \$25 to \$35 per acre. It is claimed, and has been proven, that the cost for current and metallic coating of the seed is less than fifty cents per acre, and the net cost of the apparatus installed was less than \$200.

A NEW SUBSTITUTE FOR PLATINUM.

The importance of platinum in prosecuting the war is being emphasized daily, and any substitutes deserve careful consideration. A new one, just discovered, is an alloy of 11 per cent platinum and 89 per cent gold. The results of various tests made on it show no loss in weight after 20 minutes' treatment each with 25 per cent hydrochloric acid, 65 per cent nitric acid, 96 per cent sulphuric acid and fused borax; after 15 minutes with a fused mixture of potassium carbonate and sodium carbonate; nor after evaporation of ten cubic centimeters of

hydrofluoric acid. A dish weighing 41 grams lost one milligram with fused acid potassium sulphate and 0.2 milligrams with fused potassium nitrate (20 minutes each); 7 milligrams with fused caustic potash (15 minutes), and 20 milligrams with a mixture of 96 per cent of sulphuric acid and 4 per cent nitric acid (5 minutes). It was unaffected by heating for half an hour in a smoky petroleum gas flame. Except for the high loss in a mixture of sulphuric and nitric acids, it is equal or superior to platinum ware.

THE RIGHT WAY vs. THE WRONG.

It is not always realized how greatly modern industry runs toward special materials, prepared for special use, and accordingly possessing special properties, different in one or more respects from the properties of the general class of substance in which they fall. Thus, we have a wide variety of leathers and linens and cotton fabrics gotten up with particular reference to their behaviour under a certain set of conditions; we have innumerable special alloys for special uses, which have to be considered as belonging to the same family as steel, or brass, or aluminum, or some other familiar metal, but which differ from the other members of that family in some characteristic which is of importance in connection with the use for which they are intended.

On the very ground of this distinguishing feature it is frequently necessary to modify in some way, the treatment which custom prescribes under certain conditions. If we succeed in raising the melting point of a metal at the sacrifice of some of its hardness, it may well be that some of the traditional processes carried out on that metal will have to be altered in order not to have a destructive effect in view of the increased softness. The makers and marketers of the new substance will know just what the conditions are with regard to such matters, and they will prescribe certain precautions or certain special steps which must be taken in using it under the critical circumstances.

The user will not always know why these special regulations are laid down, and there is always a certain degree of temptation for him to transgress them, and treat the new material in all respects as he has been in the habit of treating the one which it is intended to replace. But so sure as he does this he is making trouble. The special instructions have not been formulated just for the fun of it; and if it is desired to reap the benefits of the new and presumably superior material the user should be prepared to handle it in the way advised by the maker.

An excellent case in point is one which recently arose in connection with a new lead-base die-casting metal. A user stated, before a technical body, that this material would oxidize very rapidly at temperatures of 700 degrees and over—temperatures to which, by the way, it is regularly exposed in use. And to be sure, it does so oxidize, if the special precautions outlined by the maker to prevent that very thing are not followed. If the speaker had been willing to concede that the maker probably knew more about the new alloy than he himself did, and to pay proper attention to the directions dictated by that superior wisdom, he would have been spared the pain of placing himself in an untenable position. If he was not willing to depart sufficiently from the paths of habit to comply with these instructions, he should have been content to go right on using the good, old babbitt metals with which he was familiar, and forego the possible advantages of the new materials.

ALFRED T. MARKS.

AGRICULTURAL NOTES.*

Scientific Progress in the Sugar Industry.

The report of the standing committee of the Louisiana Sugar Planters' Association, on this subject, made to the Association on October 11, 1917, is given in full in the *Louisiana Planter* of October 20.

We reproduce below some paragraphs of this report, which show that the Louisiana cane-sugar manufacturers are turning their attention seriously to the utilization of the by-products of the sugar-cane industry, which are referred to in the editorial of the present number of this Journal:—

'The high price of alcohol has made the use of molasses for fermentation purposes quite profitable. This in turn, has reacted upon the price of molasses to such an extent as to interfere seriously with its use in preparing cattle feeds. The high price of potash salts has also resulted in several experimental plants for its recovery from vinasse or distillery slop. From a commercial standpoint potash recovery from cane molasses has probably not passed the experimental state. On the other hand, the alcohol plants have been continually enlarged. The growing importance of industrial alcohol serves again to emphasize the enormous amount of red tape attached to its manufacture. When tax-free alcohol for industrial purposes was first proposed, the idea was that there should be a number of small plants large enough to supply the demands of a small community or perhaps a single corporation. Inspectors and red tape have made this impossible, but the fermentation of various by-products of the cane industry is too important to permit the present condition of affairs to go on unchallenged. It has recently been suggested

that molasses be not fermented into alcohol, but into acetic acid, to be used in the manufacture of calcium acetate which in turn would yield acetone. This proposition is practical, as there is no government control of the process. If the commercial problems could be satisfactorily solved, it would be particularly applicable to sour juices and the like. The idea would seem to be worth investigation.

'The use of bagasse and molasses in connection with the making of mixed feeds for cattle is of considerable economic importance. A company is now undertaking to place this process on a commercial basis. Several new propositions for the making of paper from bagasse have been organized in the past year, and these will operate either with bagasse or with bagasse and wood pulp mixed. They are expected to start active operation during the coming season.'

The Making of Coco-nut Butter.

Owing to the high price of butter, numerous inquiries are being made in Jamaica and elsewhere how to make coco-nut butter. At present, coco-nut butter is largely used in Great Britain and France in place of dairy butter, and even before the war it was well known in Germany. It might be used wherever dairy butter is used. The process of making butter is described in the *Journal of the Jamaica Agricultural Society* of February 1917, as follows:—Grate or grind in a mill the meat of the nut as fine as possible, and for the meat of each average nut add a pint of boiling water. Put this in a press, so that the milk can be squeezed out separate from the pulp. This milk can be used in place of cow's milk for any purpose, and is especially good with stewed fruit. To make butter, this milk can be separated in a separator, or allowed to stand in a pan to let the cream rise, which it should do in about the same time as the cream in cow's milk. The cream can be set to ripen, and

* Selected by the Director of Agriculture in Mysore and the Secretary, Agricultural Committee of the Mysore Economic Conference.

be subsequently churned in the usual way. The whole process is in every respect the same as in making dairy butter. Wash out the butter milk and add salt to taste. As a rule, this butter is white, and annatto colouring can be added. According to the size of the nuts, it should take six to ten nuts to make a pound of butter. The churning should be done in a cool temperature, say, between 60 or 70 degrees.

Sugar in Hawaii.

A recent calculation of the yield of sugar in Hawaii during five-year periods shows the following remarkable development in productiveness: 1902-6 the yield was 4.40 tons sugar per acre; 1907-11 the yield was 4.87 tons; and from 1912-16 the average reached was no less than 5.23 tons. It is claimed that the aggregate production, which increased from 1½ million tons for the first named period to upwards of 3 million tons for the period ended 1916, has been due to better agriculture rather than to increased areas.

Wastage in Manure.

One of the chief uses for keeping cattle on an estate is to obtain manure, and there is great loss if the manure is wasted. On many estates, for want of sufficient labour or for other reasons, the manure is allowed to remain in the pen until most of its richest properties are lost, but a certain percentage of waste is avoided if the manure is mixed with the litter of cattle or with earth. Some interesting experiments, reported by the late Dr. N. H. J. Miller in the *Annual Report of the Chemical Society*, for 1916, on the effect of straw in farmyard manure, showed that, whilst a mixture of cow and horse manure without straw lost more than 5 per cent of its nitrogen in four weeks, the addition of 8 per cent of wheat straw resulted in gains of

nitrogen, amounting to 3.7 to 4.8 per cent. In each case there was a great increase in the number of bacteria especially when straw was added. Azotobacter was not identified; it was, however, found that the activity of the nitrogen-fixing organisms was greater in the manure with straw.

In another series of experiments, made to ascertain the effect of different kind of litter, it was found that all the manures, with or without litter, gained nitrogen in the first four weeks. From the fourth to the eighth there was a fairly rapid loss of nitrogen, so that in the end all the manures contained less nitrogen than at the commencement.

The amount of nitrogen as ammonia, which varied from 0.7 to 1.7 per cent of the total, showed a tendency to increase in the second week, after which there was a fall, but the proportion of ammonia was never very large. The nitrogen soluble in water, representing 41 to 48 per cent of the total, decreased rapidly during the first four weeks, and the total losses amounted to 70 to 90 per cent of the initial quantity.

A Virus for the War on Rats.

Vermin of one sort or another levy a heavy toll upon the farmer, and amongst up-to-date methods in agriculture must be included the use of a bacterial preparation for combatting the rat plague. The French Government is now distributing, for the use of peasants, the virus known as "Ratinol," the value of which has been widely recognised in France, where it has undergone a thorough testing. It has only recently been put on the British market in any quantity.

Dr. J. de Christmas, M. D., of Paris and Copenhagen, is the inventor, and the services he has thus rendered to agriculture have been recognised with the title of Officer of the Legion of Honour. A factory has been completed in this country, and a representative of the *Agricultural Gazette* recently interviewed Mr. W. H. Pinnock, the managing Director to obtain some particulars of it.

We take what follows from our well-known contemporary.

The virus, as supplied, is a liquid, which has to be combined with an absorbent which rats or mice will eat. It is first mixed with an equal quantity of fresh milk, which dilutes the poison and also masks its flavour. It is important to prepare the poisoned food without touching it by hand, a caution which applies also to the plates or whatever it is exposed on, as otherwise there is a danger that the vermin will avoid it.

The poisoned rats do not die in their holes, but come out for air and water. They are so eager after water that they will fall in; it is therefore better to cover over water cisterns for a few days after the poison is placed about the runs. A rat generally dies about twenty-four hours after taking it.

Rabbits are susceptible to "Ratinol"; but domestic animals and birds are unaffected by it. Dogs and cats, however, should be locked up when the bait is about, that the vermin may not be disturbed while consuming it.

There are manifest advantages in a virus of this kind, over a poison which is equally deadly for poultry and domestic animals; and all those who are suffering from a plague of the rodents will do well to give this modern antidote a trial. Full particulars are obtainable on application to the Ratinol Company, 30, Mark Lane, London, E. C.

Sugar Beet.

Whilst we in this country are suffering for past neglect of a very vital industry in having to pay big prices or go short of sugar, almost all other countries where it is possible to grow beet have made themselves self-contained in this essential. The largest beet sugar mill in the world is at Spreckles, California. It slices 3,000 tons of beets a day.

The sugar-making season is short; one hundred days is called a profitable "run." The manufacture of sugar begins with the harvest of the beet crop and continues until freezing weather in the fall. Factories and the capital invested in them are idle nearly nine months in the year. During the winter the sugar beet industry is at a standstill, except the branch of it devoted to the sale of manufactured stock on hand. Early in the spring the planting begins. It takes 5,000 acres of beets to supply the raw product for a 500 ton mill. As many of the mills can slice 1,000 tons of beets in twenty-four hours, it requires 10,000 acres to keep them up to capacity, which means a field 15 miles long and 15 miles wide. In 1916, 70,000 farmers planted 700,000 acres in beets. The average yield is 10 tons to the acre. Some farmers, however, get 20 tons. Germany averages nearly 15 tons. One man can plant, cultivate and harvest 10 acres. If he has good land and has thoroughly mastered his business he ought to grow 15 tons per acre. His crop, then, would be 150 tons, which, at \$6 a ton, would sell for \$900. The standard beet on which values are based must contain 14 per cent sugar, and must be 80 pure in quality—quality meaning the absence of mineral substances. It takes from four to five tons of beet to make one ton of sugar.

Food Value of Garden Crops.

At a recent meeting of the Royal Horticultural Society, Mr. F. J. Chittenden, F.L.S., V.M.H., gave a most interesting lecture on the above subject, which was illustrated by diagrams giving the weight produced of various vegetables, together with the number of calories—or food value. Given in their order in root crops they are as follows: Potatoes 1; Jerusalem artichoke 2; celeriac 3; parsnip 4, onion 5, and carrot 6. Salsify was also mentioned as having a higher food value than a good many people imagine. Peas and beans used in place of meat, the

lecturer mentioned, were of very high value, soy beans being more valuable than others; but soy bean culture, Mr. Chittenden said, he did not think was practicable in this country, owing to its blooming very late in the season—viz., September. Two other varieties, however, are on trial at Wisley, from which good results are anticipated. Haricot beans have proved successful, but butter beans require a much longer and stronger period of sunshine than we get in this country. Twenty-five pounds of shelled peas the lecturer had produced to the square rod, and these in food value were sufficient to keep a man for four days, while 63 lbs. of French beans had been grown on the same space of ground, and as these contained more calories than peas it was suggested that beans be cultivated for preference, peas being more of a luxury crop. In green crops the food value of edible parts of cabbage stands first with a weight of 345 lbs. to the square rod; the Savoy comes second and cauliflower third. Spinach is low in food value. The food value of fruits was also touched upon, and it may interest and surprise some of our readers that grapes come first, cherries second, plums third, and apples fourth—that is, according to calories. At the present time, when by compulsion rather than as a matter of choice many of us have become vegetarians and fruitarians, there is perhaps no subject more interesting than the food value of vegetables and fruits, and we hope the Royal Horticultural Society will publish Mr. Chittenden's lecture in pamphlet form, together with a reproduction of the diagrams.—*Fruit, Flower, and Vegetable Trades Journal.*

Drying Vegetables on a Large Scale.

That locally produced food-stuffs must be reserved for local needs is evidently becoming a truism in these islands, says the *Barbados Agricultural News*. This is shown by government Proclamations in different islands prohibiting the exportation of such things as corn and potatoes, yams and eddoes, peas and beans.

But the problem is not entirely solved by such a step. With regard to many locally produced foods, there is a difficulty in storing them for any length of time so as to preserve them in a sound and wholesome condition. In several recent issues of this Journal attention has been called to this point, and recommendations as to methods of drying roots and other vegetable products for future use have been put forward, based on experience in other countries.

Especially has attention been drawn to the possibilities of drying and storing sweet potatoes in considerable quantities, as was successfully done in Antigua some years ago by Mr. Spooner, who contributed an account of his successful experiment to this Journal. Vol. XV, No. 402. From that account it may be gathered that the ability to effect this is well within the power of practically every estate manager. We have not received any communication as to whether such drying of potatoes or other roots has been tried. Even however at the risk of appearing prolix, we return to the question, as a shortage of imported foods, if not the absolute cessation of any importation, seems, in view of the present world's situation, not only very possible, but very probable.

In the *Journal of the Department of Agriculture of Victoria*, Australia, October 1917, there is a description given of a kiln evaporator for the production of dried apple rings. This description is extracted from a bulletin issued by the Agricultural Experiment Station of the State College of Washington, U.S.A. This method of drying

apples, with perhaps slight modifications, seems very suitable for application to sliced sweet potatoes or any other vegetable product. It is claimed for the kiln evaporator that it may be constructed and operated at a lower cost than is necessary for other driers of similar capacity, and that the quality of the product is better and more uniform.

Plans and details of construction are given in extenso in the article referred to. The smallest plant is a building 20 feet square and two stories high, the lower story, which contains the stoves or heating furnaces, being about 10 or 11 feet high, while the second story, where the fruit is spread on the floor to be dried, is only about 6 or 7 feet high at the eaves. The floor is made of narrow slats laid with an interval of $\frac{1}{4}$ or $\frac{3}{8}$ inch between them, and the product to be dried is spread upon this floor to a uniform depth of 4 to 6 inches. Two lines of pipes conveying the heat from the furnace are carried round the room one or more times at a distance of 2 feet from floor and wall.

Such a kiln will dry a charge of sliced apples, spread 5 or 6 inches deep, in from eighteen to twenty-four hours. The actual daily working capacity for a kiln 20 feet square is from 70 to 100 bushels, according to circumstances.

The cost of such a building will, of course, vary according to local prices, etc., but a New York firm contracts to erect one of concrete blocks, and to equip it fully with the necessary appliances for \$1,450. A noticeable appliance is the bleacher, by means of which the sliced apples are subjected to sulphur fumes, in order to avoid their turning dark in the process of drying.

A plant of such a kind might be of greatest value in any one of these islands at the present time, for drying all sorts of vegetables and enabling them to be stored for a long time without danger of spoiling.

The Industrial Use of Cotton.

The Industrial uses of cotton are rivalling its use for clothing and household fabrics. Twenty years ago the use of cotton in Industry was scarcely dreamed of; to-day excluding explosives some 4,000,000 bales are probably taken up for purposes outside the clothing business.

The manufacturers of Motor tyres in America alone, it is stated in the India Rubber Journal of June 1917, are consuming 500,000 bales of long staple cotton a year, while belting, fire hose, and electric installation will call for as much more. There are many industrial uses for cotton cloth and heavy canvass, such as aprons and elevators for harvesting machines, bags for grain, cement, sugar and flour, tarpaulins and canvas for steamships its use as insertion in a large variety of rubber goods, and the railway uses for air-brakes, upholstering and other purposes, that will approximate 2,000,000 bales. Cordage takes 100,000 bales. In normal years the estimate for absorbant cotton and surgical bandages is 15,000 bales. There are no available figures for the present consumption.

One cannot touch industry at any point without coming in contact with cotton in some form or other. The celluloid and artificial industries, and the artificial leather industry are all dependant on it.

NOTES.

The Committee of the Bengal Chamber of Commerce has issued a report on the future trade policy of India concerning tariffs. After considering the opinion expressed by individual firms the Committee came to the following decision. The policy to be followed in this connection should be, the Special Sub-Committee think, based on the principle of reciprocity with preference within the British Empire. In other words the treatment of imports into and exports from the British Empire should be made to depend mainly on the treatment accorded by foreign nations to exports to and imports from British possessions. If a country is willing to extend to the British Empire the advantages of free trade then the Empire should be willing to trade with that country on the same terms. On the other hand, tariffs should be imposed as against those countries who levy import duties on the British Empire. There need not be a general policy of protection except, perhaps, in the case of new industries until such time as they are established, or in the case of industries which are being substantially extended or reorganized.

Piecegoods:—The Committee says that the Sub-Committee are strongly of opinion that Empire trade in these important goods must be protected in order to regain what has been lost.

India Jute Mills Association.—(a) That jute is not an absolute monopoly of India but a conditional monopoly the chief condition being price; (b) that the possibility of substitutes being found and of other methods of carrying goods being introduced cannot be prudently ignored; (c) that advantage should be taken of measures and export duties imposed during the war to create a machinery which would be available for use against those countries which protect themselves against the jute manufactures of India or any other part of the British Empire.

An interesting review of the progress of irrigation in British India for 1916-17 has recently been issued by the Public Works Department of the Government of India. It shows that the total area irrigated by all the productive public works amounted in the year to slightly more than seventeen million acres. Towards this total the Punjab canals contributed nearly eight million acres, Madras three and a half millions, the United Provinces two and a half millions, and Sind one and a half millions. The return on capital outlay was the highest in Madras, where, excepting two systems, the canals yielded 13.2 per cent, and in the Punjab, with a return of 12.99 per cent, while in the United Provinces and Sind percentages of 8.55 and 7.57 were obtained. The mean for the whole of India was 8.81 per cent. Protected works irrigated totalled 385,000 acres and gave a return of 1.08 per cent, while minor works of all classes irrigated altogether were about eight million acres. Among the works contemplated are the Sukkur Barrage and the Sind canal system, which is now being investigated by a special staff, the Sarda scheme in the United Provinces, and five schemes in the Punjab.

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Some particulars of the paper substitute driving-belts, which are now being introduced into German work-shops, are given in the *Bulletin des Usines de Guerre*. The paper is cut into narrow bands which are then spun. The belts are made by weaving or braiding. Woven paper belts are of two kinds—paper fabric and paper thread belts, the former being the more frequently used. The fabric is first cut into bands 40 m. long, which are subsequently made up according to the desired width and thickness. A core of strengthening material is interposed, either cotton or sheet metal, though more recently these cores have consisted of paper thread and metal wires interwoven. The core is surrounded with the paper strips and the whole sewn

with strong thread. Belts so prepared are said to be very flexible and to wear satisfactorily. Woven paper belts have a tensile strength of from 100 to 125 kilos per centimetre of width.

In the Spanish Senate on May 3rd Senor Cambo said that the Government is occupied with a large scheme for the development of hydro-electrical energy, and he more than hinted at the existence of a plan for working thus the main railways of the country. According to the special correspondent of the *Daily Mail* in Madrid, practically all hydro-electrical plant in Spain is run with machinery supplied by Germans whose "usual commercial forethought has been displayed in a systematic cultivation of the subject as well as in a good deal of surveying and buying of properties where this power could be developed on a large scale." There is said to be enough water-power in Spain "to do the whole work of the country." The correspondent points out that the industrial development of Spain is "hung up for lack of communications and transport," the latter at present depending on coal.

Figures recently published by the Department of Statistics in India show that in the year 1915 there were in that country 4,053 industrial establishments, employing in the aggregate 1,335,147 persons. Of the total establishments, 171 were owned by Government, local bodies, or State *darbars*; and 3,882 by companies or individuals. For the leading industries—cotton, etc,—the particulars are given separately. Industries employing less than 5,000 persons are included under "others." The industries in the latter category number 649, with nearly 100,000 hands. Cotton-mills and cotton-ginning and pressing factories combined employed upwards of 400,000 persons. The 72 jute mills, 69 of which are in Bengal and the remaining three in Madras, came next with

250,464 operatives. In addition, 26,305 were working in jute presses. Tanneries and leather works, of which there were 41, had 9,339 employees.

We take the following from the Report on the working of the Co-operative Societies in Assam for 1917-18:—Four new societies for the supply of weaving materials were registered in the Assam Valley Division towards the end of the year and consequently did not come into operation during the year under review. The weavers' societies in the Sylhet district are doing quite well and would have done even better had not the price of yarn been so high. A Co-operative stores was formed in a big tea garden in the Jorhat sub-division for supplying the labour force with the staple commodities of life. It did not begin work till the close of the year. This is an interesting experiment and if the manager can make a success of it, he should have many imitators.

According to information laid before the Imperial Institute Committee for Canada at a recent meeting in London, under the chairmanship of Sir George Perley, High Commissioner for Canada, great interest is being taken by Canadian tanners in the representative collection of Indian cowhides which was despatched to the Dominion by the Hydes and Tanning Materials Committee of the Imperial Institute. The collection is being exhibited at various centres under the auspices of the Canadian Ministry of Trade and Commerce, and several inquiries have already been received from Canadian firms as to supplies of the hides. It is probable that as soon as the Government restrictions on the disposal of Indian hides are relaxed, a considerable trade will be done direct with India.

According to the *Board of Trade Journal* the Department of Agriculture and Commerce, Japan, has announced that from 1st

According to the Administration Report of the Gondal State for 1917-18, the principal articles of indigenous make in the State are cotton and woollen fabrics, gold embroidery, brass and copper ware, wooden toys, wood work turned on the lathe and bangles of wood. July official inspection will be enforced on silk crepe and "kabe" crepe for export purposes, with a view to developing the export trade in this particular line. In this connection the authorities explain that since the outbreak of the war the shipments abroad of crepe and "kabe" crepe have shown considerable increase. Before the war the shipments did not exceed in value 800,000 yen a year, but the shipments last year amounted to 5,000,000 yen. The export trade in this line was started some ten years ago. Upon the conclusion of the war the trade may decline, and this is the reason why the authorities have decided to enforce inspection on the exporters (Yen = 2s. 0½d. at par.)

Enquiries were undertaken by the Department of Statistics, India, regarding the outturn and price of Mangalore roofing tiles. Returns were received from 42 out of 70 factories. Of the remaining 28 factories, 13 were unable to reply, and 15 were either closed, or amalgamated with other concerns, or only recently came into existence. The results of the enquiries show that the 42 factories from which returns were received, turned out, in 1916, 61 million tiles. The average selling price per 1,000 tiles previous to the war at factory was Rs. 28 and it rose, during the war, to Rs. 34. The average selling price at Bombay was, before the war, Rs. 55, and this rose to Rs. 80 during the war. This increase is mainly attributed to want of tonnage and a consequent rise in sea freights.

According to the *Munchner Neueste Nachrichten*, private trade in saccharine and dulcine is forbidden in Germany by the Saccharine Law of 1902. Re-

cently the surreptitious traffic in these articles has assumed considerable dimensions and advantage has been taken of this fact to practise fraud. Preparations are frequently offered as saccharine which are not saccharine at all, but consist of carbonate of soda, gypsum, cement, etc., or are adulterated with such ingredients. This pretended saccharine is sold at many times the official price, and generally in original packages which have already been used, or fraudulent imitations of the official packages, or forged Swiss packages. The purchaser runs the risk of suffering considerable injury to health.

The Government of India have issued a circular asking local Governments to constitute Provincial Boards of Agriculture to discuss questions of local agricultural interest with a view to effect some devolution and decentralisation of the work of the Department of Agriculture. They have also suggested that large landowners, representative agriculturists and others interested in rural development might be invited. The nature of the questions to be discussed by the Boards and the precise measure of non-official representation in them are yet to be explained. It is stated that the Agricultural Advisor of the Government of India will be invited to attend the Provincial Boards.

According to the Administration Report of the Gondal State for 1917-18, the principal articles of indigenous make in the State are cotton and woollen fabrics, gold embroidery, brass and copper ware, wooden toys, wood work turned on the lathe and bangles of wood and ivory. There were 764 cotton handlooms against 767 the year before. The number of woollen and silk-weaving handlooms was 67 and 2 against 69 and 2 last year. The number of ginning factories and cotton presses was 6 and 3, respectively. The Iron Foundry at Gondal is on a moderate scale. Difficulty is felt by the latter as regards raw material. A leather tanning factory is owned by a Mahomedan gentlemen at Upleta. The war has given some impetus to the business. The local *Dheds* were first taught the work by experts imported from Madras. Half a dozen oil engines of small

capacity, providing power for ginning cotton, pumping water, making ice, milling, flour, etc., are worked at several places in the State.

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The manufacture of iron and steel in Japan is being pushed with all expedition. The Mitsu Rishi Company is just completing a new 32,000,000 yen steel plant in Korea, which is expected to turn out some 90,000 tons annually. Japan at present produces 479,000 tons of iron and 778,000 tons of steel each year, but by the end of this year she expects to be capable of turning out 1,150,000 tons of iron and 1,165,000 tons of steel; and if all her plans are carried out, by the year 1923 she will be able to produce annually 1,500,000 tons of iron and 2,140,000 tons of steel, and 1,580,000 tons of steel goods.

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The Trades Commissioner for the Government of South Africa in 1912 gives the following list of soya bean products:—Vegetable (like marrowfat-peas), ups, meat substitute, chocolate substitute, macaroni preparation, flour, artificial milk cheese, coffee substitute, artificial horn, biscuits and food for diabetes patients, sauce, meal for cattle, oil, oilcake, fertiliser, beancake. The oil extracted from the soya bean, he points out, is used in the manufacture of the following articles:—Dynamite and high explosives, soaps, linoleum, rubber substitute, margarine, paints, varnishes, toilet powder, waterproof cloth, paper umbrellas and lanterns, salad oil, lubricating oil, lamp oil, preserving sardines, lard substitute.

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In Gwalior an institute for research has been built comprising laboratories for a Chemist, a Botanist, a Bacteriologist and an Agricultural Engineer as well as buildings for the display of agricultural machinery, and implements likely to suit local needs.

GLEANINGS.

The Bakerian Lecture at the Royal Society was delivered by the Hon. Sir Charles Parsons, K.C.B., F.R.S., on "Experiments on the Production of Diamond." The paper alluded to some of the results of experiments described in papers by the author to the Royal Society in 1888 and 1907, more particularly those on the decomposition by heat of carbon compounds under high pressure, and on the effect of applying pressure to iron during rapid cooling. A description was given of experiments designed to melt carbon under pressures up to 15,000 atmospheres by resistance heating and by the sudden compression of acetylene oxygen flame, and by the firing of high velocity steel bullets through incandescent carbon into a cavity in a block of steel. Allusion was made to experiments on chemical reactions under high pressure and their results. The pressures occurring in rapidly cooled ingots of iron, and experiments bearing upon the question, were discussed. Experiments at atmospheric pressure and experiments *in vacuo* were described. The main conclusions arrived at were that graphite cannot be converted into diamond by heat and pressure alone, within the limits reached in the experiments; that there is no distinct evidence that any of the chemical reactions under pressure have yielded diamond; that the only undoubted source of diamond is from iron previously heated to high temperature and then cooled; and that diamond is not produced by bulk pressure as previously supposed, but by the action of the gases occluded in the metal and condensed into the centre on quick cooling.

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According to H. M. Trade Commissioner in Melbourne, it has been decided by the Victorian Government that before undertaking the development of the brown

coal deposits, to which considerable attention has been devoted, for the supply of electrical energy, an investigation should be made as to the possibility of utilising the water-powers of the State for the same purpose. The Tasmanian Minister of Mines is reported to have stated that he does not anticipate any difficulty in financing the development of water-power on the King River at the cost of £1,000,000. It is estimated that 45,000 h. p. can be developed on this river.

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The British Minister of Reconstruction has appointed a committee to advise him as to the procedure to be adopted for dealing with the position of the chemical trades after the war. The committee consists of Sir Keith W. Price (chairman), Mr. T. Anderson, Mr. T. F. Brunner, Dr. C. Carpenter, Professor T. G. Lawn, Sir William Pearce, Mr. K. B. Quinan, and the Right Hon. J. W. Wilson, with Mr. G. C. Smallwood, of the Ministry of Munitions, as secretary. The officers of Government Departments have been appointed with the concurrence of their respective Ministers, and the other members of the committee at the suggestion of a representative meeting of chemical manufacturers. Dr. Addison has requested the committee to conduct its deliberations with a view to the creation of some organization which should be adequately representative of the trade as a whole, and by means of which the trade may be enabled in future to continue to develop its own resources and to enlist the closest co-operation of all engaged in the chemical industry.

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According to the *Melbourne Age*, an extract from which has been forwarded by H. M. Trade Commissioner in Australia to the Board of Trade, a pure white mineral wool is being manufactured at Yarraville, a suburb of Melbourne, from basalt rock, or "bluestone," vast masses of which are found in the neighbouring district and Footscray.

This is a new industry in the commonwealth, and has been started by an American firm. The mineral wool has a staple of $1\frac{1}{2}$ to 2 inches. It is said to be pure white with a fine metallic lustre showing through it, and in texture it is soft and pliable. It is easily adapted for engine packing, and is already in use in the Yarraville factories. It can also be moulded into sheets like asbestos. Only the shortness of the staple militates against its use for weaving. There is said to be a growing demand for it as an insulator for packing machinery or ice-chests, and as a substitute for asbestos.

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The West India Committee have been informed that the Government have decided to give to the signatories to the Brussels Sugar Convention the requisite six months' notice of their intention to resume complete liberty of action in respect of their policy with regard to sugar. When the British Government withdrew from the Brussels Sugar Convention in 1913, they gave a pledge to the signatories not to give a preference in the duties in the market of the United Kingdom to sugar from British Colonies, or to cane sugar over beet, without six months notice. The West India Committee have constantly urged that such notice should be given immediately in view of the desirability of taking steps to secure the development of the British sugar industry, and to render the British Empire self-supporting in respect of its sugar supply.

SPEECHES AND PRONOUNCEMENTS.

THE WAR AND RECONSTRUCTION.

Mr. Lloyd George's Review.

A speech on war and peace and national policy after the war was made by Mr. Lloyd George, the Prime Minister of England, on September 12 in receiving the freedom of the city of Manchester. As the speech, of great interest from the point of view of Economic reconstruction after war, we reprint its main portions below :—

Mr. Lloyd George said in the course of his speech:—The end of all war is to impose a just and desirable peace on your enemies. What are the conditions of a just and desirable peace? The first indispensable condition, in my judgment, is that civilization should establish beyond doubt its power to enforce its decrees. (Cheers.) As long as there is doubt left in the mind of either the offender or the defender of the irresistible character of this power once it is challenged, this war will not have achieved its purpose. Victory is essential to sound peace. Unless you have the image of victory stamped on the surface the peace will depreciate in value. As time goes on the Prussian military power must not only be beaten, but Germany itself must know it. The German people must know that if their rulers outrage the law of nations the Prussian military strength cannot protect them from punishment. (Cheers.) There is no right you can establish, national or international, unless you establish the fact that the man who breaks the law will meet inevitable punishment. (Cheers.) Unless this is accomplished the loss, the suffering, and the burdens of this war will have been in vain. We shall have to repeat the horror, our children will have to repeat the horror, of war.

Do you realize what this war means? We went into it with an equipment which every soldier regarded as perfectly adequate. So it was to every conception of war that had been formed. What has happened? Discoveries have been made in the art of destruction which if we had only time to perfect them would simply destroy and crash civilization from the face of the globe. You can see now what these weapons of war are. High explosives, powerful artillery that had never taken battlefield before, cities bombarded at a distance of 70 or 80 miles—and there is no reason why it should not be a hundred

—bombarding aeroplanes getting more and more powerful and more and more destructive, submarines poison in the air; that is the result of three or four years of intense thought and human ingenuity. Give a man that most terrible of all things, give him 20 or 30 years of concentrated thought on these lines, and what is to happen to following generations? This must be the last war. (Loud cheers.) The last, or, believe me—I have been studying all this machinery of war for months as a business and for years as a part of my business—believe me, if this is not the last war there are men here to-day who will see the last of civilization. That is why in all earnestness I want to say to those who have the same horror of war as I have, who would like to see any rational means of bringing this madness to an end, do not let us be misled into the belief that the establishment of a League of Nations without power will in itself secure the world against that catastrophe. A League of Nations with a Prussian military power triumphant; why, it would be a league of fox and geese—one fox and many geese, many at first, then gradually diminishing in number. (Laughter) Read the Brest Litovsk Treaty. Poland was once a greater nation than Prussia and in its day as great as France. The Teutons have absorbed it. Unless there is victory the plans for the new world on which we hope to see the dawn bursting—those plans might as well be shelved. I tell you the best time, the best thought, the best energy, the best resources of the nation devoted to averting conflict or preparing for it are useless unless you stamp out for all time the rule of brute force which has challenged humanity in this war.

WAR AIMS.

I am for a League of Nations. In fact, the League of Nations has begun. The British Empire is a League of Nations. The Allied countries who are fighting the battle of international rights are all a League of nations. If, after the war, Germany repudiates and condemns her perfidy, or rather, the perfidy of her rulers, then a Germany freed from military domination will be welcome into the great League of Nations but the only sure foundation is a complete victory for the cause of a justice and international freedom which the Allied nations are now carrying along the road of triumph through barbed-wired entanglements, deep implacements, and the serried ranks of a redoubtable foe. There have been other terms which have been indicated. I have stated them repeatedly on behalf of the British nation. They were so moderate as to command even the support of the whole of the trade union labour representatives of this country. President Wilson has stated them from time to time and we stand by them. I will only make this further

observation about peace. It must be a peace that will lend itself to the common sense and conscience of the nation as whole. It must not be dictated by extreme men on either side. You cannot allow the Bolsheviks to force on us a peace so humiliating as to dishonour and to make a repetition of the horrors of this war inevitable. Nor can we allow Chauvinists to impose terms that will leave a stain upon the conscience of the allied people and subject them to the inevitable punishment that wrong doing brings in its train. We must not arm Germany with a real wrong. In other words, we shall neither accept ourselves nor impose upon our friends a Brest-Litovsk Treaty. Now when a peace of the character I have indicated is secured we can then proceed with a clear conscience and a steady nerve to build up a new world in which those who have sacrificed so much may dwell in peace, security and content. To establish the new world we must take heed in time lest we fall back into the welter of the old.

We must be ready as soon as the unseen hand casts the rainbow of peace on the sky. And to be ready is summarised in one word—we must profit by the lessons of war. It has been the most costly schoolmaster any nation ever had. I am not sure it had not been the best in many ways, and the first lesson it has taught is the immense importance of maintaining the solidarity of the British Empire. (Cheers) It has rendered service to humanity the magnitude of which will appear greater and greater as this generation recedes into the past. It helped to stop the rush of barbarism that was sweeping over Europe. It has held the unfenced highways of the world free for the armies of freedom to pass and repass. The British Empire alone could not have accomplished that object. This Empire has never been such a power for good. To suggest that such an organization could fall to pieces after the war would be a crime against civilization. The Empire will not have survived all its troubles even after this war is over. The British Empire will be needed after peace to keep wrongs in check. Its mere word will count more next time than it did the last. For the enemy know now what they have got to deal with. But it must be there to give the word, and to ensure that it will be there not only to develop, strengthen, and enrich but, above all, to unite must be the task of statesmen throughout the world. What has to be accomplished in the way of achieving practical unity still has to be done to make the Empire a more concentrated and solid force than it is at the present moment.

THE NATION'S HEALTH.

What is the next great lesson of the war? It is

that if Britain has to be thoroughly equipped to meet any emergencies of either war or peace it must take a more constant and a more intelligent interest in the health and fitness of the people. If the Empire is to be equal to its task the men and women who make it up must be equal to it. How does Britain stand in that light? We have done great things in this war. We would have accomplished greater if this country had been in condition; and a war, like sickness, lays bare the weakness of a constitution. What has been our weakness? Let us talk quite frankly. We have had a Ministry of National Service and carefully compiled statistics of the health of the people between the ages of 18 and 42. Now, that is the age of strength. You have three grades, I, II., and III., and all I can tell you is that the results of these examinations are startling, and I do not mind using the word appalling. I hardly dare tell you the results. The number of Grade II. and Grade III. men throughout the country is prodigious. So much so that we half suspected the doctors; but there were re-examinations which did not make very much difference; and I apologize to the doctors here for the first time.

What does it mean? It means that we have used our human material in this country prodigally, foolishly, cruelly. I asked the minister of National Service how many more men we could have put into the fighting ranks if the health of the country had been properly looked after. I staggered at the reply. It was a considered reply, and it was. 'At least one million.' If we had only had that million this war would have been ended triumphantly. Here we are the combing out the essential industries. There are questions whether you should bring miners back or keep them in the Army—a few tens of thousands; whether you can put a few thousand more men into munition works; and yet you had a million men who, if the State had taken proper care of the fitness of the people, would have been available for the war. And the vigour and strength of the workers of this country have been unsatisfactory even in pursuits where all conditions are favourable to the development of a fine physique. The results in agriculture have been almost as disappointing as in any other industry. In a thoroughly healthy occupation of that kind everywhere a virile race has been wasted by neglect and want of forethought, and it is a danger to the State and to the Empire. I solemnly warn my fellow-countrymen that you cannot maintain an A1 Empire with a C3 population. (Cheers).

THE IMPORTANCE OF THE HOME.

Unless this lesson is learned the war is in vain. Remember that the health of the people is the secret

of national efficiency and national recuperation. With our machinery we take the greatest care. If it is material we look after it. If the steel is defective, through badly ventilated or ill-constructed furnaces or insufficient fuel, if the machinery is inadequately oiled and looked after and overworked, and repairs are not done in time and not done thoroughly, then your machinery is of no use; and man is the most delicately constructed of all machines, and it is bad business not to look after the man, the woman, and above all the child. The most important workshop in the land is the home (A voice, "Hear hear") There is a lady there, I can see, who at once accepts that proposition. (Laughter). And the quality of the steel in the national fabric depends upon it. If it is unhealthy, ill-supplied, ill-managed, the quality of the children becomes defective and it cannot bear the strain. Now what are the influences that make for the health of the people? The first is the houses in which people dwell. You can not bring up healthy people in unhealthy homes. The problem of housing in this country is the most urgent that awaits solution. We have talked about it, we have played with it for 40 or 50 years. But it has never been really taken in hand. It has only been taken in hand in the way in which an untidy or slovenly housewife takes up the cleaning work of her house—just the part of house which the visitor can see. There has been too much in our city slums of the bad housewife kind. That is not the way to deal with a problem which effects the strength of nations. It is hopelessly in arrear. No Government, no party has had the courage to grapple with it. No good business man who has some sort of redundancy which he discovered in his business which was wasting his energies would say he would not trouble with it. He would thoroughly search it out and thoroughly put it right. That is going to be done. It is equally true of the whole of the public health question.

We have Acts running into hundreds and hundreds of sections. We have had Regulations which would fill a library. We have had the most attractive pictures of model dwellings, and endless authorities. But you cannot plough the waste land with forms. You cannot sweep away slums with paper, and you cannot cope with the wants of the people with red type. That is the first thing that has to be dealt with. The next is that there ought to be a more intelligent organization of the forces which have special charge of the health of the nation—national, municipal and medical. In this respect I doubt if there is a first-rate country in the world where less has been done. We have enormous losses to make up, the fallen, the crippled,

and the mutilated. Their case must be particularly thought out, but we must also think of the children who are to fill up the gaps in the generations that are to come and the State must see they are built up into a fine, healthy, strong, vigorous people. There is no surer way of strengthening this country than that. (Cheers).

What more have we to do to improve the life of the country? We see that wages during the war have been raised, and we must see in future that labour is rewarded with wages that will sustain life in full vigour, the life of the worker and the life of his children, and it is the great part of the State to bring them up to take their part. I am glad to see that in agricultural labour wages have gone up. Fourteen shillings a week was a monstrous wage. There must be healthier conditions in the workshops. Many of them are admirable, many of them are tolerable and many not tolerable. Bad health for the nation is bad business for all. What is the next lesson of the war? We must pay more attention to the schools. The most formidable institution we had to fight in Germany was not the arsenals of Krupp or the yards in which they turned out submarines, but the schools of Germany. They were our most formidable competitors in business and our most terrible opponents in war. An educated man is a better worker, a more formidable warrior and a better citizen. That was only half comprehended here before the war. I am glad that since then we have had Mr. Fisher's great Bill. That is a great step forward towards redressing the blunders of the past.

Still there is a good deal to be done. I have had conversations with men of all ranks of life since the war. I have been deeply impressed with one sentiment among them all—namely that these things that were tolerated before the war cannot be tolerated any longer. There has been a community of sacrifice. The national conscience has been stirred in a way which is unparalleled in the history of this country, and the nation when this war is over will expect put right the wrongs, inequalities, and stupidities from which millions have suffered and the community has suffered.

A GREAT LEAP FORWARD.

There are times in the history of the world when nations take a great leap forward. This is such a time. There is a great river in Eastern Europe which, after meandering through hundreds of leagues, finding a great barrier in its road, concentrates the whole of its strength and breaks through rushes along, and, when it has emerged from the rock, it deploys into a sunnier land into more fertile regions. That is the story of the national life in

this country before, during, and after the war. It has taken a great rush forward, and when it emerges from the rocks through which its torrents are now struggling into a sunnier and fairer land, the men who have endured the discomfort, the terror, the fortune of this mighty struggle have not gone through it all to re-establish more firmly in this land for which they have fought the dominion of slums, of wages that will not maintain let alone cheer, the life of confusion and of disorganization which creates waste. Insufficiency, misery and squalor. To enable the nation to bear the gigantic burden of debt which the war will impose on us and the still greater burden of recuperation and reconstruction we must see that our national resources are developed to the full, and that the State renders all the assistance in its power to attain that object. Comfort is the surest preventive of anarchy, but comfort involves plenty. You can ensure plenty by ensuring the best conditions for production. If abundance is not there you cannot distribute it.

A BOLSHEVIST MENACE.

That is an obvious truth which the Bolsheviks seem to have overlooked. The Bolshevik began with distribution and ended with distribution. Production did not concern him. That is the surest road to national poverty. The Bolsheviks said, "Let there be peace". When asked, "What manner of peace?" they say, "That's quite immaterial. Let there be plenty for everybody," and when you say, "Where does it come from?" they say, "That does not concern us." What is the result? You have had neither peace nor plenty in Russian and you will not get it here if you have men of that type. There are far too many of them, and unfortunately, they are in a position to render mischief. You should shunt their teachings like an attack of poison gas. It withers the vitality of nations. The state must help to promote and encourage production. It must remove hindrances to production and ensure the confidence and serenity which are essential to production. There must be none of that shrinking from national organization, national production, and national assistance. Germany never made that mistake.

Take the most important of national industries, agriculture. Agriculture in the past has been overlooked in this country. It has been neglected, with the result that we have been dependent very largely on lands across the seas for our food. We have realized during the war the perils of this position. We have been dependent on others not because Great Britain cannot produce food, but because we never realized the importance of home production. Last year we accomplished a great deal, and this year we have progressed, and our production has

been increased by hundreds of thousands of tons of grain. It is in the highest interests of the community that the land in this country should be cultivated to its fullest capacity, and I doubt whether there is a civilized country in the whole world where agriculture has received less attention at the hands of the State. There has been a good deal of talk of small holdings and allotments, and there has been a good deal of rapid scratching on the surface, often by men who know very little about it. But the real problem of cultivating land to its utmost capacity has never been tackled. In the future we must see that its representatives have the necessary attention and encouragement. There is a good deal of land in this country which is not fit for the production of food, but it is capable of producing timber. In other lands the State saw that these wastes were planted. We have taken no steps of that kind as a community. Agriculture and afforestation constitute the healthiest and best occupations for human beings. The cultivation of the land is the basis of national strength and prosperity, and the cultivation of the land includes the minerals under the land. We have made an extravagant and wasteful use of these rich deposits. By a conservation of these resources to a large extent into electric power we could not merely assist existing industries, but new industries could be established under healthier conditions all over the land, and there would be a saving of the cost of production. Increased wages could be much better borne without increased cost to the consumer or impairing our chances of competing with neutral markets.

TRANSPORT PROBLEMS.

Another of the lessons of the war is the importance of improving transport facilities in this country. You are fairly all right in Manchester. You have a good many magnificent railways branching out from your city, but there are many towns and certainly multitudes of villages in this country that are not equally favoured. They are hardly favoured at all. Railways, light railways and the like, enter into every phase of national prosperity and well-being. Housing is a huge question. Agriculture is largely a question of transportation. Foreigners get their produce to the English markets more cheaply and more speedily than do our own farmers. That is folly, and it is equally true of many other industries. The war has shown the importance of transportation and has shown how it can be speedily improved (Cheers)

There is another important point—namely, the shielding of industries which have been demonstrated by the war to be essential to the very life of nation. I remember well when I was appointed Minister of

Munitions I found there were industries essential to national defence which had been very largely captured by our enemies. There does not seem to be, I am very glad to say any, difference of opinion amongst any party in the State that these essential key industries shall be preserved after the war, not because we anticipate another war, but because we are less likely to have another war if they know that we are quite ready for any challenge on a just ground. These are some of the objectives of peace. It would be a mistake—in fact, it would be impossible—to attempt a statement of detailed plans in this hour crowded with other and more important concerns. That is quite true at any moment of the war, but there are minds considering all these points—experts, so that when the war is over the nation not lose time in setting its house in order. It is idle to pretend that the best method of dealing with all these intricate, delicate, complex problems, far-reaching and immense, is in the power of any Government.

THE TIME FOR RECONSTRUCTION.

The whole mind and energy of the Government is necessarily absorbed in the prosecution of this war to a victorious end, but the moment that struggle is over the work of reconstruction must begin. We must have reconstruction when we have the lessons of the war fresh in our minds. We must reconstruct when the national limbs are supple with endeavour and before they become stiff with repose and slumber, and you must reconstruct when you see you have behind you that great spirit of patriotism and sacrifice which has been raised from the depths of human nature in every house and every breast in this land. You must reconstruct when you have got behind you the momentum of victory to carry you through to an even greater triumph. That is why the whole field of national enterprise, of national endeavour and national resource and of material well-being is being examined carefully with a view to immediate action before the great spirit grows cold in the frigid atmosphere of self-interest. Let us have it when the nation is riding the chariot of a high purpose ere it comes down to the dusty road. That is the time to reconstruct, that is the time to build, when there is the spirit of fraternity throughout the land, when there is no longer rich and poor of one party or another, but one people, one spirit, one purpose, one soul to lift our native land not merely above the menace of a foreign foe, but above the wretchedness, the squalor, the horror, the misery which so many of the men and women and children who live on the hearthstones of this old land have been enduring. I have been amongst the people and I know it, and I want to see this thing righted after the war.

I deal not with plans, not with details, and above all not with programmes. I am sick of programmes. (Laughter and cheers.) I deal with what are called, in military language, objectives, something which you mean to get at with all your artillery, with all the weapons in your power. These objectives we ought to get at, and if we agree as to objectives do not let us quarrel about methods. Let us keep one people until we get there. (Cheers.)

And that is my appeal. We must approach these problems with judgment undeterred by past prejudices and predilections, and, May I say, past appeals. We are really not infallible, and when when you are in earnest and when you are in earnest and when you have the great experience of this war, when you see the firmament illumined through the whole earth, you must see things you never saw before otherwise it is time for you to go to an oculist. If men decline to take the best course because it is inconsistent with something they said or thought before, they will never achieve anything but controversy. For Heaven's sake don't let us plant new lands with barren fig trees. I ask no man to scrap his principles. I only ask that new facts revealed by the war should be considered with an open, unprejudiced mind enriched by the unparalleled experience gained in this war. It is idle to pretend that this vast convulsion has taught us nothing. Men who learn nothing are fitted for nothing, and they certainly ought not to be employed in the settlement of after-war problems, because they are dangerous men. Do not turn your backs on the future nor dote on the present. You will forgive me when I say I see the King of Doting in and around the sheds where the various party machines have rested. I can hear sounds of elaborate preparation for setting up the old merry-go-round. (Cheers). That would give men the illusion that they are prancing at a terrific speed when they are really circling around the same old cranking machine to the same old tune.

NO CLASS DISTINCTION.

The next thing is, we must face these problems with courage. When you come to the war millions of people are full of courage, but when faced with the problems of peace some-how or other it vanishes. You will never tackle successfully a job of which you are afraid. The next thing is the effort must be equal to the task. That is one of the lessons of the war. We must handle the problem of reconstruction boldly. And the next thing, and the last, is that all classes must be invited to assist, to co-operate, to device, to work out the problems. The fatal vice of Bolshevism is that it left to one class to the exclusion of all others the management of the trade, commerce and industry of the whole nation.

What has been the result? Bad management; and no class has suffered more than the class that was supposed to be in supreme control. They are starving with their pocket bluing with paper money. There are men with hundreds of roubles who cannot buy food. All who have any knowledge or experience or capacity to contribute ought to be called on. I have been at the head of four Departments of State since this war began, and there I have come into contact with every section of the community. The workmen of this country contributed by their industry and skill to the winning of the war. The business men of the community I found assisting me at the Exchequer to save the country from the financial panic, which would have destroyed confidence and made it impossible to win the war. It was the same at the War Office. Great engineers, great contractors, managers, and others engaged in transportation came to help. Their work has been invaluable. I do not know how we could have run the war had it not been for the assistance we have had from men who have been running great business in shipping and food and transport and production of every kind. It would have been quite impossible. They freely and gladly gave their services to the country, and to endeavour to reconstruct the national life of the country—which depends so much on its commerce, its trade and its business—without securing the co-operation of these different heads, of the direction of those important branches of national activity, would be disastrous to the national well-being.

We want neither reaction nor revolution, but a sane, well-advised steadiness of bold reconstruction. I have troubled you at this length with these matters not because I want to divert the attention of the nation from the great dominant issue upon which we ought to concentrate our strength the winning of the war, but because when peace comes I do not want the nation to be taken unawares. There is a great deal of talk about preparing for war in time of peace, but it is equally important to prepare for peace during war. Delay will be disastrous. In a world so highly strung, a world whose nerves have been strained for years, there is peril in an appearance of procrastination. The men in the trenches, brought face to face with the actuality of the conflict, are I am sure, thinking, thinking hard thinking deeply, about the kind of home-land they will return to when this struggle is over. Let us see it is one that is worthy of their heroism. There are disturbing symptoms all over Europe which we at home would be wise to take note of and provide against. In my Welsh home we have an infallible method of ascertaining when a storm is coming. There is a lighthouse beyond the western hills, and

when the whether is fair or settled you never see its light, but now and again it illumines the darkness, and you then know that the storm is coming. I have been scanning the horizon and I can see flashes on the sky which indicate to me that there are grave atmospheric disturbances in the social and economic world. In the natural world you cannot avert the storm by thinking. In the more artificial world of human society you can, if you take things in time, avert the hurricane. I have one word of advice to my countrymen, and I say it solemnly to them: Take heed in time, and if you do we shall enjoy settled wheiher for the great harvest which is coming when the fierce heat of summer which is beating upon us in this great war will be over and past. (Loud cheers).

THE FOOD SHORTAGE IN MYSORE.

Sir M. Visvesvaraya's Speech.

The following are the opening remarks of Sir Mr. Visvesvaraya, Dewan of Mysore, at a meeting of principal officers of Government and leading non-official gentlemen, recently held at Bangalore to consider the measures to be adopted for meeting the present Food Supply situation:—

The object of this meeting is to enable the officers of Government to take counsel with the representatives of the people and invite your co-operation in regard to the food situation which, as you are aware, has reached an acute stage. It has been brought on by a variety of untowards circumstances beginning with the war, by the export of food grains, short crop in other parts of India last year, restricted transport facilities both by land and sea, but mainly by the failure of the south-west monsoon.

Happily, within the last few days, one important contributory cause has been removed—I refer to the end of the great world war. We rejoice that the Allied Powers have won a decisive victory and that the autocratic powers who began this destructive war have been themselves discomfited. This glorious victory we owe to the heroism and self-sacrifice of the armies and navies of the Allied Nations, among whom the British Empire, by common consent, took the leading part and made the heaviest sacrifices. It is a matter for honest exultation that Indian troops were also privileged to take a share in this titanic struggle and that the loyal and unselfish co-operation of India on this occasion has resulted in raising the status of our country in the

estimation of the other parts of the Empire and of the world.

To come to the business before us, this meeting is convened to consider the measures needed to cope with the difficulties which have arisen on account of the shortage of food supply and the prevailing high prices. The immediate problem we have to face is of a two fold character, namely:—

(1) How to mitigate the hardships caused chiefly by panic and the dislocation of trade in food, grains and

(2) how to ensure an adequate food supply for the entire population of the State for the next twelve months.

It is true people are undergoing grave hardships at the present moment, but viewed calmly, the general situation in Mysore is not so bad as is imagined in some quarters or as it is in several other parts of India I could name and where these same difficulties are being courageously faced.

INFLUENZA.

Of course, the immediate cause of the disorganization of trade is the visitation of the influenza epidemic within the past six or seven weeks. On account of illness, their own or of members of their families, many of the merchants could not visit the weekly fairs regularly. The disease appeared in a mild form in July last and, after a period of slow incubation, it re-appeared in a virulent form and assumed serious proportions from about the 1st October.

It is estimated that nearly a fourth of the entire population were seized by the disease and that quite two percent succumbed to it in a little over 5 weeks. Coming at a time when the poorer classes were suffering from malnutrition, the epidemic has worked great havoc among large masses of the population. In small hamlets, the loss of population has been as high as 10 to 25 per cent; in some case, whole families have been wiped out.

When the epidemic suddenly developed, when the blow came, it caught us napping. Having regard to the extraordinary character of the disease, the Government and the people have done their best to mitigate the horrors of the situation. Our meed of praise is due to the Presidents of the two city Municipalities and Deputy Commissioners, to the many officers and subordinates of the Revenue and Medical departments, and particularly to the numerous public men who came forward to assist Government and the municipal authorities and gave freely of the money, time and energy. Nor should I omit to mention the enthusiasm of the younger generation—students and other volunteers—who showed such a fine spirit of unselfish service in carrying food and medicines to the very doors of the poor and

the needy, without any regard to the risks they were running.

The disease, which reached its climax between the 25th and 28th October, is happily now on the decline everywhere while in some places it has altogether disappeared. We have, therefore, breathing time now to concentrate our attention on the measures needed to meet the food situation.

PRESENT FOOD SUPPLY SITUATION.

You are aware we recently took a rough census of stocks of food grains in the whole State. This disclosed a stock of about 56,000 tons of rice, 210,000 tons of ragi and 21,000 tons of jola (jowar) or a total stock of 287,000 tons. These are, of course, very rough figures and it is surmised that the stocks are very largely under-estimated. The general opinion of experienced officers and public men competent to judge the matter is that the actual stocks available are nearly 500,000 tons, or double what the estimates show. Subject to future verification, we may assume this figure for our present purpose.

To this stock, additions will be made in the coming harvest which, as you know, can only be a meagre one. The yield from this source may not exceed 3 lakhs of tons and, as it is calculated that the total supply of food stuffs needed for a whole year for the population of the State is about 11 lakhs of tons, we shall be left with a deficit of nearly 3 lakhs before the next year's harvest can be gathered.

The staple food grains of the country are practically two, viz., ragi and rice. It is well known that we cannot get ragi from outside and it is only rice that can be imported. It seems wise, therefore, to take steps to import at once at least one lakh of tons of rice, if we can get so much, and the balance during the remaining months. It must, however, be remembered that rice is too expensive an article of food for our poorer classes.

The situation requires very close watching and as it will probably be changing rapidly, we must be prepared to revise our forecasts and plans and go on adjusting efforts to obstacles almost from week to week.

Government are aware that there is much suffering and many people are said to be subsisting on one meal a day. I have heard that in some towns people feigned illness in order to get a dole of *conji* intended for the influenza patients.

The immediate problem is how to allay the scare and secure, as far as may be possible, an equitable distribution of available stocks in all parts of the State. This Government are confident, will be effected with your co-operation, and by the steps they are now taking.

Our hope is that the north-east monsoon may yet be plentiful and give us a *vaishakhi* crop. The clouds and rain are still with us but I have no opinion of them. They are not of the usual honest sort. They don't seem to mean business. Perhaps, the coming *mungar* or hot weather rains may be more favourable. The close of the war may relieve the tension; transport facilities may be released to some extent both by land and sea to enable us to import outside supplies.

On the other hand, we cannot ignore the fact that our assumptions as regards stocks are at present only a surmise. They may, on closer examination, be found incorrect. Supplies from outside may fail through lack of stock, consequent on the present world food shortage. If, after taking a correct inventory, it be found that a deficiency of supply must be faced, we must be prepared to ration the entire population. Although it is better to be forewarned, Government have every hope that there will be no necessity for taking such an extreme step,

ACTION TAKEN BY GOVERNMENT.

Eversince August this year, the situation has been giving room for anxiety. Taking advantage of the powers conferred on them by the Defence of India Regulation, Government brought under control paddy, rice, ragi and jolam, as early as the 6th August. In September they took the further step of fixing maximum prices for certain foodstuffs in Mysore, Bangalore and Tumkur districts. An attempt has also been made to open grain shops through departmental or municipal agencies or with the help of private merchants or philanthropic citizens. Recently the Director of Civil Supplies and the Deputy Commissioners have been empowered to acquire private stocks. I would specially invite your attention to the Government Order, dated the 11th instant, which lays down clearly the lines of future policy. The order has been communicated to the public also in Kannada. We have ordered an accurate census of food supplies and the preparation of a plus and minus statement of stocks for each town and village. Abstract statements will be prepared for each taluk and each district. We have also arranged for the association of non-official agency with Government officers in operations connected with the acquisition of stocks and in their distribution. We have appointed a whole time Food Controller for organising food supply arrangements on uniform lines throughout the State and for regulating the movement of stocks from district to district. Action has also been taken to secure such supplies as can be had from British Indian Provinces and Burma. When the arrangements now ordered come into proper working order, I have little doubt we shall have a complete command of the situation.

The problem, however, is a novel one and Government are doing all they can and are prepared to do all that is necessary, to mitigate the situation. We are in close touch with the public and my colleagues and myself have recently been discussing the situation in every detail with the Deputy Commissioners and the leading public men and merchants in the district. As already stated, we have been trying to import as much rice as we can get with the help of the Food Controllers in British Indian Provinces. The emergency, however, is one requiring the united energies of all of us, and the Government will welcome helpful suggestions and offers of co-operation from every quarter, from the public generally and from the mercantile community in particular.

There are two or three allied matters to which I should like to refer in passing. Foremost among them is the necessity of economising food supplies. Economy means additions to our stocks and every citizen in the State should make it his duty to practise it now, and avoid all forms of waste. It is no use commandeering stocks if we are to hand them over for prodigal use. Our efforts will avail little without this much self-control on the part of the public.

Next, we have a large population among us which cannot earn enough to make both ends meet under the present high prices. Their earnings, where they have any, have not risen in proportion to the rise in prices. Each local area has a responsibility to provide for its own poor as far as possible. To this end, relief funds should be started and a complete organisation brought into existence, aided, if necessary, by municipal and Government funds. I would bespeak your earnest attention to this question without loss of time.

Lastly, there is the question of finding employment for the labouring classes and the poorer cultivators. Large public works are in progress in several parts of the State, and there is no lack of employment. On the contrary, it is difficult to get labour in many places at present. Village works will be started and relief works begun at a later stage, as soon as the necessity is felt.

GENERAL ECONOMIC SITUATION.

The present economic situation in the State depends on a variety of causes, some external, some internal, some temporary, others permanent.

The supply and prices of food grains are governed chiefly by the conditions in British India and our ability to cope with a difficult situation, like the present, depends largely on a correct understanding of the situation and the policy followed in British India, and on the constant help and support of the

Government of India, which we are glad to acknowledge, is at all times generously given.

The difficulties of our population are intensified by their low economic condition. If they can afford to pay for their food, high prices will cause no great hardship.

I have already indicated the temporary causes of food scarcity which are common to other parts of India, may, to the whole world. The permanent causes lie deeper, the deepest being our poverty and low economic efficiency. There are large sections of our people who live a hand to mouth existence, whose standard of comfort is very low and who are abnormally sensitive to the effects of inferior harvests.

Gentlemen, I am never tired of reminding you that, as a people, who have little education and no organisation; our savings are slender, our stamina is poor, our earning power is low. Our people have not yet learnt that disciplined combination which is necessary for economic success. A people cannot have, at the same time, both the ease of the old world life and the advantages which come from modern industry and the adoption of strenuous business methods.

The war is over to-day. Reconstruction will begin to-morrow in every part of the civilised world in the West as well as in the Far East. Are there no reconstruction problems for us, while 90 per cent of the population you represent are yet illiterate and while 80 per cent are still living in mud houses and thatched huts?

But these are large questions and the present is not the time for such reflections.

APPEAL FOR CO-OPERATION.

I do not wish to exaggerate or extenuate the situation. But this much I will say, there is no ground for panic, at all events for the present. A complete workable scheme is before you and the representatives of Government are here to answer your questions, to ask for your views and to consider your suggestions. The public may also send in, any further suggestions they may wish to make, in writing to the Chief Secretary within the next two days. Any reasonable modifications necessary, as a result of these conferences and communications, will be given effect to immediately under the orders of His Highness the Maharaja. The mercantile community particularly must not chafe at restrictions, which are imposed in the interests of the people as a whole and which at the present juncture are necessary to avoid loss of life.

Lastly, I will venture to give you this piece of advice.—Keep your heads cool and loyally co-operate in carrying out the directions given from day to day by the executive officers who will be assisted by committees on which the public will be represented. So far as in you lies give every help in your power to the officers and committees, co-operate with one another in your own towns and villages and see that the statements and returns are correctly furnished; that stocks are not held back, that merchants do not profiteer, and, for the rest, trust to His Highness' Government to do the right thing in the right way.

TOPICS FROM ECONOMIC PERIODICALS.

AGRICULTURAL EDUCATION AND RESEARCH.

Study of German Methods.

In an able article entitled 'The German Challenge to British Agriculture,' which appears in the *Journal of Agriculture of Victoria*, Vol. XV, Part 4, p. 128, the Agricultural Superintendent of that Colony considers that apart from her economic policy, which has been systematically directed to produce sufficient foodstuffs within her own territory to feed her rapidly increasing population, Germany's progress may be largely attributed to her comprehensive system of agricultural education and research.

Despite her unfavourable climate and average quality of soil, German production—measured in terms of aggregate output per farm, or average yield per acre—stands at the head of the agricultural countries of the world. The aim of the scheme of education was the union of science and practice, and perfection in technique. Germany organized a scheme of education which provided for:—

(1) The *adult* farmer, by the establishment of legally constituted Chambers of Agriculture, a Central German Agricultural Council, and by providing experimental stations, peripatetic instructors, and literature relating to every phase of plant and animal husbandry.

(2) The *youth*, by means of graduated agricultural instruction extending from the schools to the Agricultural Colleges and the University.

(3) For *research*, by providing well equipped Agricultural Experiment Stations throughout Germany, and several Departments of Agriculture at the Universities.

The object of these institutions was to prosecute research work, make a thorough study of methods and principles, and train for the future agricultural leaders of Germany.

Britain and her Dominions cannot afford to do less than what Germany has done. Indeed, if Britain is to re-establish her leadership in agriculture, her organization in agricultural education must be even more thorough than Germany's.

Government grants for agricultural institutions in Germany have hitherto been on a much more liberal scale than in Britain. The expenditure on agricultural instruction in Prussia alone was £484,000 in 1910. The total expenditure in agricultural education in England and Wales for the same year was £117,000.

The ultimate objective of any scheme of agricultural education should be to increase the agricultural output of the State. This may be achieved (1) by making the present generation of farmers more efficient by diffusing among them a knowledge of the scientific principles underlying their industry; (2) by giving the farmers of the future, *i.e.*, the boys and youths of the present day, a sound training in agricultural science and practice. All progressive agricultural countries provide organizations for achieving both these objectives. The agricultural output of a state may be temporarily stimulated by tariffs, or fixing of prices for products, bonuses, and other artificial aids; but the only way to secure a permanent increase in output from the land is to improve the farming methods of a country and apply the teachings of science to its agricultural practice.

Provision must be made for (1) the application of existing knowledge in all branches of plant and animal industry; (2) the acquirement, by means of experiment and research, of new knowledge which will form the basis of future improvements in the practice of agriculture.

The application of science to agriculture, however, requires a body of trained agricultural scientists; some to engage in research work and attack new problems, others to apply existing knowledge to local problems, and to show how the adoption of correct farming methods inevitably increases the output.

A body of trained workers is required to act as evangelists who will spread the gospel of better farming methods, and transform those who, at present, farm by rule of thumb into active apostles of the profitable practices dictated by the achievements of science.

DEPARTMENTAL NOTES.

Education.

The following order has been issued :—

(No. G. 7849-51/ Medl. 130-16-4, Dated Bangalore the 29th October 1918.)

In Government Order N. 1112-4/ Edn. 37-18-2 dated 2nd August 1918, Government have in the case of men candidates desirous of studying for the Degree in Medicine in the Colleges at Madras and Bombay, increased the number of scholarships to 6 for the next 5 years and have fixed the value of each of these scholarships at Rs. 40/- for graduates and Rs. 30/- in the cases of others. In supersession of all previous orders Government are now pleased to revise the number and rates of scholarships to candidates of both sexes who undergo training to

qualify themselves for the several grades in the Medical service as follows :—

Medical Degrees :—3 scholarships will be awarded each year to lady candidates desirous of studying for the Degree in Medicine in the Colleges at Madras and Bombay. The value of each of the scholarships will be fixed at Rs. 60/- for graduates and Rs. 50/- for undergraduates.

Sub-Assistant Surgeon's Course :—25 scholarships will be awarded each year, at Rs. 15/- each, per mensem to male medical pupils and 4 scholarships at Rs. 20/- each per mensem to female candidates for 4 years, for undergoing training as Sub-Assistant Surgeons in the Mysore Medical School, the cost of books, instruments and school fees being defrayed by Government as hitherto.

Compounders :—24 scholarships for males and 4 scholarships for females at Rs. 8/- and Rs. 10/- respectively each per mensem, will be awarded for one year, for training as compounders at the District Head-quarter Hospitals.

Sick-Nurses :—8 scholarships at Rs. 15/- each per mensem will be awarded for a period of two years.

Midwives and Dayees :—18 scholarships at Rs. 10/- each per mensem will be granted to Dayees (*i.e.* local women practising midwifery) in the local institutions and 10 scholarships at Rs. 15 per mensem, for women to be trained in Midwifery for a period of one year.

The Sick-nurses, midwives and dayees will be trained at Bangalore, Mysore or Robertsonpet, where there are well equipped Maternities and Hospitals for general diseases.

The total cost (per annum) amounts to Rs. 66,664. The above scholarships should be met from the Education Budget, specific mention being made in the Medical Budget also by a foot-note.

The proposal of the Senior Surgeon to the increase of the rate of stipend to the Mysore Medical pupils studying in the Royapuram Medical School, from Rs. 10/- to Rs. 15/- per mensem, with effect from 1st July 1918, is also sanctioned. The Senior Surgeon is requested to point out the source in the current year's budget to meet the enhanced rate of scholarships in question.

The number of scholarships noted above for each class is only tentative. Government will be prepared to increase the same if suitable candidates come forward for undertaking the course. Candidates should be chosen from all the several Districts.

(Sd.) G. SREENIVASA IYER,
For Chief Secretary to Government.

CIRCULAR LETTERS.

The following circulars have been issued:—

Circular C. No. 18 of 1918-19.

To

All Inspecting Officers of the Education Department.

Under Government Order No. 30-2/ Edn. 27-18 dated 16th October 1918, the Central Panchama Boarding School at Mysore has been reorganized into a Central Panchama Institute providing English Education of the Lower Secondary standard, Kannada Education of Lower Secondary standard with Lower Secondary Training and Kannada High School Education of a three year course combined with normal training, and courses in the following industries:—

- i. Book and Shoe-making.
- ii. Weaving.
- iii. Carpentry & Smithy.
- iv. Tailoring.
- v. Agriculture & Sericulture (Compulsory).
- vi. Brick-laying and house-building.

Inspecting Officers are hereby requested to select likely pupils after personally satisfying themselves in regard to the fitness to pursue English or other higher education. In choosing candidates the Inspecting Officers should take into account the age of pupils, willingness of the parents, etc. It is under contemplation to provide a small allowance to the parent who keeps his children at the school, the allowance varying with the length of time that the children are kept and the grades in which they study. Further, railway fare (1) for joining the school and (2) for journeys to and back from home for the Christmas vacation will, it is expected, be borne by the management of the institution. The Inspecting Officers will correspond directly with the Secretary of the Central Panchama Institute, Mysore, who will intimate the number of pupils that may be accommodated and the number that should be sent up from each Taluk as it is intended to give this institution a truly provincial character. Parents may be informed that all the boys that pass out from this school will be given suitable appointments in this or other Departments.

C. R. REDDY,

Inspector-General of Education.

A SCHOLARSHIP STATEMENT.

Statement showing the number and rates of scholarships to be allotted annually for training in the several grades of the medical profession.

Sl. No	Description of the course	Number of scholarships	Rate of each scholarship	Period (years)	Cost.
1	Medical Degrees	6 (Males)	Rs. 40 for graduates Rs. 30 for others	5	Rs. 14,400 (Graduates) Rs. 10,800 (others)
2	do.	3 (Females)	Rs. 60 for graduates Rs. 50 for others	5	Rs. 10,800 (Graduates) Rs. 9,000 (others)
3	Sub-Assistant Surgeons	25 (males)	Rs. 15/-	4	Rs. 18,000
		4 (females)	Rs. 20/-	4	Rs. 3,840
4	Compounders	24 (Males)	Rs. 8/-	1	Rs. 2,304
		4 (Females)	Rs. 10/-	1	Rs. 480
5	Sick-Nurses	8	Rs. 15/-	2	Rs. 2,880
6	Midwives	10	Rs. 15/-	1	Rs. 1,800
7	Dayees	18	Rs. 10/-	1	Rs. 2,160
			Total		Rs. 56,664

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